MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

VOL. XXVII. APRIL, 1899. No. 4

INTRODUCTION.

The MONTHLY WEATHER REVIEW for April, 1899, is based on reports from about 3,000 stations furnished by paid and voluntary observers, classified as follows: regular stations of the Weather Bureau, 154; West Indian service stations, 10; cotton region stations, 127; corn and wheat region stations, 133; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,220; Army post hospital reports, 27; United States Life-Saving Service, 14; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraphic Service, 20; Mexican voluntary stations, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; the late Dr. Mariano Bárcena, Director of the Central Meteorological and Magnetic Observatory of Mexico; Señor A. M. Chaves, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Capt. J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

For the first time in the history of the Weather Bureau forecasts for forty-eight hours in advance were regularly issued from Washington each night during April, 1899, for all States east of the Rocky Mountains.

Warnings of gales of exceptional severity on the coasts and the Great Lakes were not required during April, 1899.

The most notable feature of the month was the group of severe local storms which occurred in Missouri and Iowa on the 27th. The Chicago office of the Weather Bureau issued, on the 26th and 27th, forecasts of thunderstorms for the States named.

The frosts of the month resulted in no serious damage, and were, as a rule, covered by the forecasts and special warnings.

From the 1st to the 4th a barometric depression advanced from the southern Rocky Mountain region to the south Atlantic coast, and from the 5th to the 8th a depression moved from Colorado to New England. These were the only well-marked general storms that reached the Atlantic coast from the west during the month. The storm of the 5–8th was attended by winds of 40 to 60 miles an hour along the Atlantic coast from Hatteras to New York. The most important storm of the month in the western and northwestern States moved from the British Northwest Territory over the northern districts from the 25th to the 28th, attended by severe local storms in the States of the upper Mississippi Valley, and by thunder squalls in the upper Lake region. In each instance ample warning was given to marine interests of the high winds and squalls referred to.

The following remarks have been made regarding the forecasts and warnings of frost:

The Savannah Morning News, of April 11, 1899—

> Some of the farmers had taken warning at the approach of the cold, as predicted by the Weather Bureau, and had covered their crops with a protecting blanket of hay or canvass. Others had exercised no precautions of this character, and, as a consequence, their crops have been more seriously injured.

The Advertiser, Montgomery, Ala., April 11, 1899—

> The protracted cool spell which prevailed over the South so long culminated yesterday morning in heavy to killing frosts in Alabama, Mississippi, Georgia, and east Tennessee; in fact heavy frost occurred as far south as Mobile, and light frost was reported from Jacksonville, Fla. The very effective warnings of the Weather Bureau, which were scattered very widely over this section on the 8th, were means of saving a considerable portion of the trucking crops; still very many tender vegetables were nipped by the frost.

The displayman, Mr. D. H. Miller, Crystal Springs, Miss—

> The warnings were very timely and beneficial to the truck growers of this vicinity, and gave them ample time to protect their tender vegetables, such as tomatoes and beans. Had it not been for these warnings there would have been considerable damage.

CHICAGO FORECAST DISTRICT.

Until the last few days of the month the weather conditions were without marked features. On account of the very late spring, no damage was caused by frosts.

A storm, which developed in the British northwest during the 25th, moved eastward over the northern districts on the 26th, 27th, and 28th, accompanied by thundersqualls in the upper Lake region on the 27th and 28th and severe local storms in portions of Iowa and Missouri on the night of the 27th and 28th. The following forecast was issued for Lake Michigan, April 26:

Brisk southerly winds increasing, showers and probably squalls Thursday.

On the next day this advisory message was issued to all points on lakes Michigan and Huron:

Brisk and high southerly winds, showers and thundersqualls.

Forecasts for thunderstorms were issued on the 26th and 27th for Iowa and Missouri.

By the morning of April 30 another storm had developed over eastern Colorado, which moved northeastward over Lake Superior within the next thirty-six hours, causing gales generally over the upper lakes. Storm signals were ordered for Lake Michigan at 10:30 a.m. and for Lake Huron at 10 p.m., April 30.—*H. J. Cox, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

Storm signals were ordered on the 11th and 17th, and were timely and of value, especially on the bay below Astoria, where fishing was in progress.

No river forecasts were issued during the month. Preparations were, however, made for a good service during the expected high water in May and June.

Frost warnings were issued on several occasions during the month.—*B. M. Pague, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

Abnormally warm weather prevailed during the first half of the month.

No destructive windstorms occurred.

Severe frosts occurred in portions of the Sacramento and San Joaquin valleys and in portions of the coast and San Francisco Bay sections on the 29th, causing some injury to grapes, but other fruits were uninjured. A large fruit grower from the vicinity of Fresno reports that the frost seemed to go in streaks; that occasionally one side of the vines would be turned black while the other side showed no sign of injury; also, that a thermometer hung 4 to 5 feet above the ground would show a temperature of about 40° while ice formed on the small pools of water near by. Climbing vines held up by supports were uninjured, except, perhaps, within a few inches of the ground.—*Alexander G. McAdie, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

During April there were six areas of high pressure and eight of low pressure sufficiently well defined to be traced on Charts I and II. For a description of these charts and an explanation of the figures see page 164 of this REVIEW. In preparing this matter full reports for April up to the 10th of the month only have been used. The principal facts regarding the origin, duration, velocity, and disappearance of these highs and lows will be found in the accompanying table, and the following description is added:

Highs.—All of the highs except No. I began on the Pacific coast. Nos. II and IV began on the south California coast and moved to the north Pacific coast before appearing on the land. The general motion was east or southeast. Nos. II and IV were last noted near the middle Mississippi Valley. No. II was followed to the Florida coast. Nos. I, IV, and V disappeared over Nova Scotia or Newfoundland.

Lows.—A rather permanent low pressure in southern California was the locus, or origin, of lows I, II, VI, and VIII. Nos. III and VII were first noted on the north Pacific coast, and IV and V to the north of Montana. The general motion of these lows was east or northeast. No. I was last seen off the Florida coast, No. VI in the middle Mississippi Valley, Nos. V and VII disappeared to the north of Lake Superior, and Nos. II, III, IV, and VIII were last seen on the north Atlantic coast or over Newfoundland. The highest winds of the month accompanying these lows were as follows: On the p. m. of the 4th, as low No. I approached the south Atlantic coast, a north wind of 56 miles an hour occurred at Hatteras. On the evening of the 7th as low No. III approached the middle Atlantic coast, Kittyhawk reported a southwest wind of 48 miles and New York City 46 miles from the east. The night of the 7th and 8th Woods Hole experienced a southeast wind of 48 miles. On the evening of the 16th, from the influence of a storm off the New England coast, New York city reported a northwest wind of 46 miles and that night Nantucket had a northwest wind of 48 miles. On the evening of the 27th, as low No. VII moved toward the upper Lakes, Marquette reported a southeast wind of 44 miles, and on the evening of the 29th, induced by the same low north of Lake Superior, Chicago experienced a southeast wind of 56 miles an hour.—*H. A. Hazen, Professor.*

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	*31, a.m.	52	114	8, p.m.	48	54	3,240	8.5	381	15.9
II	1, a.m.	37	124	7, a.m.	43	97	2,340	6.0	390	16.2
III	6, a.m.	47	127	12, a.m.	30	80	3,180	6.0	530	22.1
IV	8, p.m.	35	122	20, a.m.	47	63	4,680	11.5	407	17.0
V	18, p.m.	42	127	24, p.m.	44	68	3,190	6.0	532	22.2
VI	21, a.m.	44	124	25, p.m.	37	87	2,460	4.5	547	22.8
Total							19,090	42.5	2,787	116.2
Mean of 6 paths							3,182		465	19.4
Mean of 42.5 days									449	18.7
Low areas.										
I	1, p.m	34	113	4, p.m.	27	79	2,460	3.0	820	34.2
II	3, p.m.	32	112	10, a.m.	50	62	3,900	6.5	600	25.0
III	8. p.m.	48	124	13, a m.	47	58	3,060	4.5	680	28.3
IV	11, a.m.	53	115	15, a.m.	48	58	2,760	4.0	690	28.8
V	15, p.m.	52	118	19, a.m.	47	83	1,620	3.5	463	19.3
VI	17, a.m.	34	111	24, a.m.	41	90	3,360	7.0	480	20.0
VII	24, p.m.	48	126	29, a.m.	49	86	1,980	4.5	440	18.3
VIII	29, a.m.	35	107	†2, p.m.	43	73	2,160	3.5	617	25.7
Total							21,300	36.5	4,790	199.6
Mean of 8 paths							2,662		599	25.0
Mean of 36.5 days									584	24.3

* March. † May.

RIVERS AND FLOODS.

Interest in that portion of the Mississippi watershed north of Cairo during the month of April was confined to the Missouri River. There was the usual spring rise in the Mississippi, the crest reaching Cairo on the 29th. No danger-line

stages occurred and nothing of interest was reported, except the arrival of the first boat of the season at La Crosse on the 13th and at St. Paul on the 23d.

In the Missouri River the ice broke at Sioux City on the 4th, at Pierre on the 11th, and at Bismark on the 12th. The last floating ice passed Omaha on the 8th. After the ice moved out high stages were general from the headwaters to Kansas City, and also in the tributaries north of Omaha. Flood lines were reached from Fort Buford southward. At Bismarck a stage of 21.2 feet was recorded on the 14th, 7.2 feet above the danger line for points immediately below. At Sioux City the water lacked 0.5 foot of reaching the danger line, while at Omaha it exceeded it by the same amount. At Kansas City a stage of 23.3 feet was reached on the 28th, 2.3 feet above the danger line, but east of Boonville, Mo., no high stages were experienced, owing to the low stages then prevailing in the tributaries within the State of Missouri, particularly in the Osage and Gasconade. To these same low stages can also be attributed the fact that there was no flood in the Mississippi from Alton to Cairo.

The damage along the Missouri consisted of overflowed bottoms and wrecked railroad beds and tracks. In the Dakotas traffic was very much interrupted by washouts, and many thousand dollars' worth of damage was done. Considerable loss was also occasioned along the water front at Omaha. The losses of the farmers were not large, but spring seeding was greatly delayed.

The Ohio fell steadily throughout the entire month, except below the mouth of the Cumberland River, where the fall was checked on the 24th by a rise out of the Cumberland and Tennessee rivers, and at Cairo on the 25th, meeting, also, at this time, the advance of the upper Mississippi rise.

From Cairo southward danger-line stages were general at the beginning of the month, except at New Orleans, where the flood line was not reached until the 5th. The greatest excess above the danger line occurred at Helena, Ark., from the 10th to the 13th, when the stage was 46.9 feet, 4.9 feet above. At New Orleans a stage of 17.2 feet was recorded on the 22d, being 1.2 feet above the danger line. The loss and damage were comparatively trifling, although much was avoided in the lower Ohio and lower Tennessee basins by the accurate warnings issued by the Cairo office of the Weather Bureau. At the close of the month a general fall was in progress.

The Atchafalaya remained from 1 to 2 feet above the danger line during the entire month.

The rivers of the eastern districts did not develop any interesting features during the month. They were high in the Carolinas during the first ten days, closely approximating danger stages at many points, for which the necessary warnings were issued, but no reports of damage have been received.

In Alabama there were also quite high stages during the earlier portion of the month, but they were not in any way excessive.

The rivers of the Pacific coast district remained at moderate stages, except the lower Sacramento River, which was within 5 feet of the danger line during the entire month, with, however, a falling tendency.

The highest and lowest water, mean stage, and monthly range at 130 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

Heights of rivers referred to zeros of gauges, April, 1899.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
St. Paul, Minn [1]	1,957	14	10.5	14	5.0	8	8.1	5.5
Reads Landing, Minn	1,887	12	7.7	18, 19	—0.5	1-5	4.4	8.2
La Crosse, Wis [1]	1,822	12	9.5	20, 21	6.9	8	8.6	2.6
North McGregor, Iowa	1,762	18	11.6	25	3.3	2	8.5	8.3
Dubuque, Iowa	1,702	15	11.7	27	2.7	5	7.8	9.0
Leclaire, Iowa	1,612	10	7.5	29, 30	0.8	4, 5	4.5	6.7
Davenport, Iowa	1,596	15	9.6	29, 30	1.9	5	5.9	7.7
Muscatine, Iowa	1,565	16	11.0	30	2.5	6	6.9	8.5
Galland, Iowa	1,475	8	5.6	30	1.4	5, 6	3.8	4.2
Keokuk, Iowa	1,466	14	9.6	30	2.1	6	5.9	7.5
Hannibal, Mo	1,405	17	11.2	29, 30	3.6	5	7.5	7.6
Grafton, Ill	1,307	23	15.0	30	8.3	5, 6	10.8	6.7
St. Louis, Mo	1,264	30	25.6	27	12.0	4	17.1	13.6
Chester, Ill	1,189	36	21.4	27	9.3	4, 5	16.6	12.1
Memphis, Tenn	843	33	35.3	{1, 3-5 / 7-10}	23.4	26	31.8	11.9
Helena, Ark	767	42	46.9	10-13	36.6	28	44.2	10.3
Arkansas City, Ark	635	42	48.6	15-20	44.5	30	44.2	4.1
Greenville, Miss	595	42	43.0	17-20	38.9	30	41.8	4.1
Vicksburg, Miss	474	45	47.3	16-24	45.0	1	46.6	2.3
New Orleans, La	108	16	17.2	22	15.5	1	16.5	1.7
Missouri River.								
Bismarck, N. Dak	1,201	14	21.2	14	6.3	5	10.4	14.9
Pierre, S. Dak [2]	1,006	14	15.9	19	6.0	12	10.5	9.9
Sioux City, Iowa [3]	676	19	18.5	21	8.1	10	12.9	10.4
Omaha, Nebr	561	18	18.5	25	7.6	4	12.3	10.9
Plattsmouth, Nebr	533	17	12.7	25	4.2	4	8.1	8.5
St. Joseph, Mo	373	10	12.6	27	2.6	6	7.3	10.0
Kansas City, Mo	280	21	23.3	28	9.1	2, 4	15.2	14.2
Boonville, Mo	191	20	20.0	30	7.0	1	13.2	13.0
Hermann, Mo	95	24	18.9	26, 27	7.9	1, 2	12.7	11.0
Des Moines River.								
Des Moines, Iowa	150	19	10.0	10	3.4	3	5.9	6.6
Illinois River.								
Peoria, Ill	135	14	13.6	1	9.0	30	11.5	4.6
Beardstown, Ill	70	12	13.3	1	10.1	29, 30	11.4	3.2
Osage River.								
Bagnell, Mo	70	28	18.6	25	3.1	20	7.5	15.5
Gasconade River.								
Arlington, Mo	58	16	9.1	25	0.4	18-20	2.2	8.7
Youghiogheny River.								
Confluence, Pa	59	10	6.5	8	2.1	30	3.4	4.4
West Newton, Pa	15	23	5.6	9	1.2	23, 25	2.5	4.4
Allegheny River.								
Warren, Pa	177	7	5.0	14, 15	1.6	30	3.0	3.4
Oil City, Pa	123	13	5.9	9	1.9	28, 30	3.4	4.0
Parkers Landing, Pa	73	20	7.1	9	2.3	25, 28, 30	4.1	4.8
Monongahela River.								
Weston, W. Va	161	18	2.1	1	— 0.5	28-30	0.2	2.6
Fairmont, W. Va	119	25	4.9	1	1.0	30	2.3	3.9
Greensboro, Pa	81	18	11.0	1, 9	7.9	{24, 25 / 28-30}	6.5	3.1
Lock No. 4, Pa	40	28	13.0	1	7.2	25	9.3	5.8
Conemaugh River.								
Johnstown, Pa	64	7	5.8	8	1.6	{25, 26 / 28, 29}	2.4	4.2
Red Bank Creek.								
Brookville, Pa	35	8	2.2	8	0.7	25-30	1.2	1.5
Beaver River.								
Ellwood Junction, Pa	10	14	2.0	9	0.9	27-30	1.3	1.1
Great Kanawha River.								
Charleston, W. Va	61	30	10.8	1	4.8	24	6.9	6.0
New River.								
Hinton, W. Va	95	14	4.8	1	2.6	23-25	3.6	2.2
Cheat River.								
Rowlesburg, W. Va	36	14	5.5	8	2.0	29	3.3	3.5
Ohio River.								
Pittsburg, Pa	966	22	12.0	1	3.3	30	6.9	8.7
Davis Island Dam, Pa	960	25	12.4	1	5.4	30	8.4	7.0
Wheeling, W. Va	875	36	21.3	1	6.6	30	10.8	14.7
Parkersburg, W. Va	785	36	26.9	1	8.2	26, 27, 30	12.6	18.7
Point Pleasant, W. Va	703	39	37.0	1	7.9	26	16.2	29.1
Catlettsburg, Ky	651	50	44.6	1	10.6	27	21.1	34.0
Portsmouth, Ohio	612	50	47.0	1	12.0	28	22.7	35.0
Cincinnati, Ohio	499	50	51.6	1	14.2	30	26.7	37.4
Louisville, Ky	367	28	26.9	3	7.3	28	12.3	19.6
Evansville, Ind	184	35	40.4	5	14.0	30	27.0	26.4
Paducah, Ky	47	40	43.8	4, 5	18.8	24	32.4	25.0
Cairo, Ill	1,073	45	46.2	1-4	28.9	24	39.1	17.3
Muskingum River.								
Zanesville, Ohio	70	20	16.8	1	7.6	25	10.2	9.2
Miami River.								
Dayton, Ohio	69	18	3.6	1	1.7	30	2.3	1.9
Wabash River.								
Mount Carmel, Ill	50	15	15.1	1	5.4	{19-21 / 25, 26}	8.3	9.7
Licking River.								
Falmouth, Ky	30	25	13.3	1	3.4	30	6.0	9.9
Hiwassee River.								
Charleston, Tenn	18	22	11.0	8	3.5	23	5.5	7.5
Clinch River.								
Speers Ferry, Va	156	20	3.4	1	0.7	23	1.9	2.7
Clinton, Tenn	46	25	16.0	1	5.2	24	9.3	10.8
Tennessee River.								
Knoxville, Tenn	614	28	7.6	5	1.6	24	3.9	6.0
Kingston, Tenn	534	25	14.7	1	3.1	24, 25	6.4	11.6
Chattanooga, Tenn	430	33	23.1	1	7.1	22	11.9	16.0
Bridgeport, Ala	390	24	17.5	1	5.3	22, 23	9.8	12.2
Florence, Ala	220	16	14.5	3, 4	5.8	22	10.1	8.7
Riverton, Ala	190	25	28.8	1	7.4	23	15.7	21.4
Johnsonville, Tenn	94	21	38.9	1	9.0	24	20.4	29.9
Cumberland River.								
Burnside, Ky	434	50	29.0	8	4.0	24	11.8	25.0

Heights of rivers referred to zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Cumberland River—Con.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Carthage, Tenn	257	30	36.0	1	5.1	23	17.2	30.9
Nashville, Tenn	175	40	38.3	4	8.5	22, 23	22.4	29.8
Arkansas River.								
Wichita, Kans	720	10	2.6	6, 7	1.7	30	2.1	0.9
Webbers Falls, Ind. Ter.	407	23	18.1	24	2.8	15, 16	6.6	15.3
Fort Smith, Ark	345	22	19.2	24	3.9	10, 15-17	7.4	15.3
Dardanelle, Ark	250	21	19.2	25	3.0	12, 13	6.8	16.2
Little Rock, Ark	170	23	20.4	26	4.3	14	8.3	16.1
White River.								
Newport, Ark	150	26	22.2	27	7.0	16	11.2	15.2
Yazoo River.								
Yazoo City, Miss	80	25	25.8	9-14	23.5	30	25.3	2.3
Red River.								
Arthur City, Tex	688	27	10.6	24	4.5	1-14, 16-21	5.7	6.1
Fulton, Ark	565	28	20.3	27	3.4	15, 16	7.6	16.9
Shreveport, La	449	29	11.8	29, 30	1.5	10, 20	3.7	10.3
Alexandria, La	139	33	9.4	10	5.6	25, 26	7.2	3.8
Ouachita River.								
Camden, Ark	340	39	26.2	27	7.6	6	14.1	18.6
Monroe, La	100	40	27.8	1	20.7	26-29	23.3	7.1
Atchafalaya Bayou.								
Melville, La	100†	31	33.4	21-30	32.2	1	33.0	1.2
Susquehanna River.								
Wilkesbarre, Pa	178	14	10.2	15	2.5	30	6.6	7.7
Harrisburg, Pa	70	17	8.8	10	3.4	30	5.8	5.4
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	7.8	9, 10	3.1	30	5.3	4.7
Juniata River.								
Huntingdon, Pa	80	24	......	......	......	......	......	......
Potomac River.								
Harpers Ferry, W. Va	170	16	5.3	10	2.4	27-30	3.5	2.9
James River.								
Lynchburg, Va	257	18	3.0	1	1.4	22-26, 30	2.0	1.6
Richmond, Va	110	12	4.3	9	0.6	24-27	1.4	3.7
Roanoke River.								
Clarksville, Va	155	12	9.0	9	2.8	25	3.9	6.2
Weldon, N. C	90	27	26.3	10	8.8	25	12.1	17.5
Cape Fear River.								
Fayetteville, N. C	100	38	35.5	9	6.6	25	14.0	28.9
Lumber River.								
Fairbluff, N. C	10	6	6.3	13, 14	4.8	30	5.6	1.5
Edisto River.								
Edisto, S. C	75	6	5.4	11	4.0	30	4.8	1.4
Pedee River.								
Cheraw, S. C	145	27	23.8	9	5.0	25	10.6	18.8

Heights of rivers referred to zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Black River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Kingstree, S. C	60	12	9.1	20, 21	6.2	30	7.7	2.9
Lynch Creek.								
Effingham, S. C	35	12	12.0	8	6.7	25, 28, 30	9.3	5.3
Santee River.								
St. Stephens, S. C	50	12	9.9	1	7.9	29, 30	8.8	2.0
Congaree River.								
Columbia, S. C	37	15	6.8	1	1.3	23, 25, 30	2.5	5.5
Wateree River.								
Camden, S. C	45	24	23.0	9	6.3	25	11.8	16.7
Waccamaw River.								
Conway, S. C	40	7	6.2	29, 30	4.3	6, 7	5.0	1.9
Savannah River.								
Calhoun Falls, S. C	......	......	6.6	1	2.9	24	4.4	3.7
Augusta, Ga	130	32	19.6	1	9.7	24	12.1	9.9
Broad River.								
Carlton, Ga	......	......	5.8	1	3.1	18, 21-24, 29, 30	3.5	2.7
Flint River.								
Albany, Ga	80	20	8.3	1	5.0	15-17	6.5	3.3
Chatahoochee River.								
West Point, Ga	239	20	10.0	1	4.4	21	5.7	5.6
Eufaula, Ala	90	30	15.0	2	6.6	23	9.0	8.4
Coosa River.								
Rome, Ga	225	30	15.0	8	4.0	23	7.3	11.0
Gadsden, Ala	144	18	17.4	10	5.0	22	10.2	12.4
Alabama River.								
Montgomery, Ala	265	35	24.2	10	8.1	22	15.6	16.1
Selma, Ala	212	35	26.9	11	10.1	24	18.4	16.8
Tombigbee River.								
Columbus, Miss	285	33	5.8	1	0.4	19, 21, 30	1.5	5.4
Demopolis, Ala[4]	155	35	51.7	1	8.9	25	26.1	42.8
Black Warrior River.								
Tuscaloosa, Ala	90	38	34.0	9	8.6	23	18.0	25.4
Columbia River.								
Umatilla, Oreg	270	25	9.8	28	4.0	5	7.2	5.8
The Dalles, Oreg	166	40	15.5	28, 29	6.1	3	11.6	9.4
Willamette River.								
Albany, Oreg	99	20	9.5	14	5.2	2	7.4	4.3
Portland, Oreg	10	15	11.4	14	5.0	4	8.3	6.4
Sacramento River.								
Red Bluff, Cal	241	23	6.0	1	3.4	11, 12	4.3	2.6
Sacramento, Cal	70	25	24.2	1, 2	20.2	30	22.7	4.0

[1] Record for 23 days. [2] Record for 20 days. [3] Record for 26 days. [4] Record for 29 days.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 61.6°, or about 3.0° below normal; the highest was 98°, at Pineapple on the 28th, and the lowest, 26°, at Valleyhead on the 2d. The average precipitation was 2.80, or more than 1.00 below normal, the deficiency being greatest in the southern portions; the greatest monthly amount, 7.18, occurred at Valleyhead, and the least, trace, at Evergreen.—*F. P. Chaffee.*

Arizona.—The mean temperature was 62.3°; the highest was 105°, at Blaisdell on the 9th, and the lowest, 11°, at Prescott on the 26th. The average precipitation was 0.20; the greatest monthly amount, 2.33, occurred at Oro Blanco, while none fell at a number of stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 60.7°, or 2.3° below normal; the highest was 96°, at Conway on the 25th, and the lowest, 19°, at Pond and Silversprings on the 1st. The average precipitation was 3.28, or 1.30 below normal; the greatest monthly amount, 5.38, occurred at Mossville, and the least, 0.82, at Ozark.—*E. B. Richards.*

California.—The mean temperature for the State, obtained by weighting the reports from 288 stations, so that equal areas have about the same weight, was 58.1°, which was 0.2° above normal for the State, as determined from 205 records; the highest was 108°, at Elsinore, Riverside County, on the 8th, and the lowest, 7°, at Bodie, Mono County, on the 25th. The average precipitation for the State, as determined by the records of 312 stations, was 0.60; the deficiency, as indicated by reports from 163 stations which have normals, was 1.39; the greatest monthly amount, 3.20, occurred at Crescent City, Del Norte County, while none fell at several stations.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 45.3°, or practically normal; the highest was 90°, at Lamar on the 12th and Minneapolis on the 25th, and the lowest, 15° below zero, at Breckenridge on the 6th. The average precipitation was 0.74, or 0.66 below normal; the greatest monthly amount, 2.72, occurred at Ruby, while none fell at several stations.—*F. H. Brandenburg.*

Florida.—The mean temperature was 67.7°, or 2.3° below normal; the highest was 95°, at Wausau on the 28th, and the lowest, 32°, at the same station on the 10th. The average precipitation was 3.40, or 1.10 above normal; the greatest monthly amount, 10.75, occurred at Lemon City, and the least, 0.14, at Gainesville.—*A. J. Mitchell.*

Georgia.—The mean temperature was 62.4°, or 2.0° below normal; the highest was 95°, at Columbus on the 28th, and the lowest, 25°, at Diamond and Dahlonega on the 10th. The average precipitation was 2.73, or 0.46 below normal; the greatest monthly amount, 6.03, occurred at Greenbush, and the least, 0.83, at Leverett.—*J. B. Marbury.*

Idaho.—The mean temperature was 42.4°, or 2.3° below normal; the highest was 84°, at Hagerman on the 8th, and the lowest, 3°, at Swan Valley on the 17th. The average precipitation was 1.35, or 0.36 above normal; the greatest monthly amount, 5.28, occurred at Murray, and the least, 0.02, at Downey.—*S. M. Blandford.*

Illinois.—The mean temperature was 53.8°, or 1.1° above normal; the highest was 95°, at Bloomington on the 29th, and the lowest, 8°, at Streator on the 1st and at Minonk on the 2d. The average precipitation was 1.54, or 1.72 below normal; the greatest monthly amount, 4.64, occurred at Scales Mound, and the least, 0.14, at Chicago.—*C. E. Linney.*

Indiana.—The mean temperature was 54.4°, or about 2.5° above normal; the highest was 96°, on the 30th, and the lowest, 10°, at Lafayette and Topeka on the 2d. The average precipitation was 1.60, or about 1.75 below normal; the greatest monthly amount, 4.00, occurred at Jeffersonville, and the least, 0.13, at Hammond.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 48.9°, or about normal; the highest was 89°, at Thurman on the 12th, and the lowest, 1°, at Bedford on the 4th. The average precipitation was 2.40, or about 0.60 below normal; the greatest monthly amount, 5.76, occurred at Belle Plaine, and the

least, 0.56, at Northwood.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 54.2°, or 1.5° below normal; the highest was 99°, at Englewood on the 10th, and the lowest, 3°, at Fanning on the 4th. The average precipitation was 1.63, or 0.92 below normal; the greatest monthly amount, 7.32, occurred at Independence, and the least, trace, at Meade.—*T. B. Jennings.*

Kentucky.—The mean temperature was 57.2°, or nearly normal; the highest was 96°, at Russellville on the 28th, and the lowest, 20°, at the same station on the 1st. The average precipitation was 3.16, or about 0.75 below normal; the greatest monthly amount, 4.75, occurred at Burnside, and the least, 1.35, at Vanceburg.—*H. B. Hersey.*

Louisiana.—The mean temperature was 64.9°, or 2.8° below normal; the highest was 93°, at Mansfield, Oakridge, and Plaquemine on the 29th, and the lowest, 30°, at Minden on the 1st. The average precipitation was 3.08, or nearly normal; the greatest monthly amount, 8.70, occurred at Jeanerette, and the least, 1.15, at Clinton.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 53.3°, or 1.0° above normal; the highest was 94°, at Boettcherville, Md., on the 30th, and the lowest, 14°, at Deerpark and Sunnyside, Md., on the 5th. The average precipitation was 1.56, or 1.77 below normal; the greatest monthly amount, 3.40, occurred at Frostburg, Md., and the least, 0.67, at Smithsburg, Md.—*F. J. Walz.*

Michigan.—The mean temperature was 46.7°, or 3.4° above normal; the highest was 94°, at Camden, Hillsdale County, on the 21st and 28th, and the lowest, 8° below zero, at Humboldt, Marquette County, on the 4th. The average precipitation was 1.28, or 1.18 below normal; the greatest monthly amount, 4.63, occurred at Iron Mountain, Dickinson County; at Hayes, Huron County, there was an entire absence of precipitation, and a number of stations in the southern section have monthly amounts of less than 0.25.—*C. F. Schneider.*

Minnesota.—The mean temperature was 44.0°, or about normal; the highest was 88°, at Lake Jennie and St. Olaf on the 25th, and the lowest, 17° below zero, at Pokegama on the 2d. The average precipitation was 1.49, or about 1.25 below normal; the greatest monthly amount, 3.19, occurred at Two Harbors.—*T. S. Outram.*

Mississippi.—The mean temperature was 63.1°, or about 2.0 below normal; the highest was 96°, at Brookhaven, on the 29th and at Yazoo City on the 30th, and the lowest, 27°, at Okolona on the 3d and at Ripley on the 8th. The average precipitation was 1.88, or 2.08 below normal; the greatest monthly amount, 4.11, occurred at Corinth, and the least, trace, at Kosciusko.—*H. E. Wilkinson.*

Missouri.—The mean temperature was 54.0°, or 2.8° below normal; the highest was 96°, at Jefferson City on the 28th, and the lowest, 6°, at at Kidder on the 1st. The average precipitation was 3.67, or 0.25 below normal; the greatest monthly amount, 6.88, occurred at Liberty, and the least, 1.62, at Louisiana—*A. E. Hackett.*

Montana.—The mean temperature was 40.0°, or 3.4° below normal; the highest was 82°, at Glendive on the 16th, and the lowest, 19° below zero, at Glasgow on the 1st. The average precipitation was 1.02, or nearly normal; the greatest monthly amount, 2.29, occurred at Utica, and the least, trace, at Billings and Yale.—*E. J. Glass.*

Nebraska.—The mean temperature was 49.0°, or 0.3° below normal; the highest was 97°, at Lynch on the 24th and 27th, and the lowest, 5° below zero, at Hay Springs on the 1st. The average precipitation was 0.99, or 1.50 below normal; the greatest monthly amount, 4.63, occurred at Nebraska City, and the least, trace, at Holdrege, Cody, and Merriman.—*G. A. Loveland.*

Nevada.—The mean temperature was 47.9°, or about 1.3° below normal; the highest was 87°, at Sodaville on the 16th, and the lowest, 12°, at Palmetto on the 28th. The average precipitation was 0.37, or about 0.21 below normal; the greatest monthly amount, 1.16, occurred at Elko, while none fell at Silver Peak. During the cold spell at the close of the month the fruit crop was practically destroyed, grain and alfalfa badly damaged, and a large number of calves and young lambs were destroyed by the unusually cold, freezing weather.—*J. H. Smith.*

New England.—The mean temperature was 44.2°, or about 1° above normal; the highest was 92°, at North Conway, N. H., on the 29th, and the lowest, 2°, at Berlin Mills, N. H., on the 5th. The average precipitation was 1.68, or 1.33 below normal; the greatest monthly amount, 3.23, occurred at Hartford, Conn., and the least, 0.54, at Berlin Mills, N. H. The weather during April presented a marked contrast with conditions prevailing in March, and also with those of one year ago, and well illustrated the variability of New England climate. Disagreeable elements were almost wholly absent, and more pleasant weather for the period of the year could scarcely have been expected. —*J. W. Smith.*

New Jersey.—The mean temperature was 49.9°, or 0.3° above normal; the highest was 88°, at Hightstown on the 30th, and the lowest, 18°, at Charlotteburg on the 6th. The average precipitation was 1.73, or 1.61 below normal; the greatest monthly amount, 3.25, occurred at Charlotteburg, and the least, 0.48, at Toms River.—*E. W. McGann.*

New Mexico.—The mean temperature was 53.6°, or 0.2° above normal; the highest was 96°, at Eddy on the 26th, and the lowest, 10°, at Winsors on the 6th and 21st. The average precipitation was 0.24, or 0.15 below normal; the greatest monthly amount, 1.35, occurred at Los Lunas, while there was none at Albert, Clayton, Deming, Engle, and Springer, and only trace at Bluewater, Lower Penasco, Olio, and San Marcial.—*R. M. Hardinge.*

New York.—The mean temperature was 46.5°, or 2.4° above normal; the highest was 89°, at Dryden on the 29th and at Nunda on the 30th, and the lowest, 4°, at North Lake on the 5th. The average precipitation was 1.49, or 1.11 below normal; the greatest monthly amount, 2.94, occurred at North Lake, and the least, 0.18, at Cherry Valley. April was unusually dry, the precipitation reported from some sections being the lightest on record. Farm work was generally delayed during the first half of the month, but operations were rapidly expedited during the last two weeks.—*R. G. Allen.*

North Carolina.—The mean temperature was 55.8°, or about 2.0° below normal; the highest was 89°, at Fayetteville on the 14th, and the lowest, 18°, at Linnville on the 5th. The average precipitation was 3.57, or about 0.20 below normal; the greatest monthly amount, 8.92, occurred at Southport, and the least, 1.80, at Currituck Inlet.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 38.4°, or 3.0° below normal; the highest was 86°, at Medora on the 23d, and the lowest, 22° below zero, at McKinney on the 2d. The average precipitation was 1.37, or 1.31 below normal; the greatest monthly amount, 4.20, occurred at University, and the least, 0.40, at Portal.—*B. H. Bronson.*

Ohio.—The mean temperature was 53.3°, or 2.2° above normal; the highest was 94°, at Logan on the 29th and at Portsmouth on the 30th, and the lowest, 6°, at Hillhouse on the 3d. The average precipitation was 1.61, or 1.58 below normal; the greatest monthly amount, 4.45, occurred at Canton, and the least, 0.44, at Van Wert.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 59.7°, or 1.2° below normal; the highest was 97°, at Norman on the 18th, and the lowest, 18°, at Hopeton on the 1st. The average precipitation was 3.62, or 0.73 above normal; the greatest monthly amount, 6.30, occurred at Pawhuska, and the least, 0.20, at Mangum.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 47.0°, or 0.8° below normal; the highest was 86°, at Vernonia on the 7th, and the lowest, 12°, at Silverlake on the 19th. The average precipitation was 3.92, or 0.10 above normal; the greatest monthly amount, 16.81, occurred at Glenora, and the least, 0.02, at P. Ranch.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 50.2°, or 2.2° above normal; the highest was 92°, at Derry Station on the 30th, and the lowest, 2°, at Saegerstown on the 3d. The average precipitation was 1.76, or 1.45 below normal; the greatest monthly amount, 3.25, occurred at Hawthorn, and the least, 0.70, at St. Marys.—*T. F. Townsend.*

South Carolina.—The mean temperature was 60.0°, or 2.8° below normal; the highest was 91°, at St. Matthews on the 29th, and the lowest, 27°, at Central on the 2d, 5th, and 10th. The average precipitation was 3.02, or 0.12 below normal; the greatest monthly amount, 5.57, occurred at Smiths Mills, and the least, 1.32, at Winnsboro.—*J. W. Bauer.*

South Dakota.—The mean temperature was 44.5°, or about 2.0° below normal; the highest was 90°, at Plankinton on the 26th, and the lowest, 12° below zero, at Ashcroft on the 2d. The average precipitation was 1.55, or about 0.86 below normal; the greatest monthly amount, 4.15, occurred at Fort Meade, and the least, 0.20, at Hot Springs—*S. W. Glenn.*

Tennessee.—The mean temperature was 57.8°, or 1.0° below normal; the highest was 97°, at Dover on the 29th, and the lowest, 17°, at Erasmus on the 2d. The average precipitation was 3.47, or 0.82 below normal; the greatest monthly amount, 6.72, occurred at Oak Hill, and the least, 1.30, at Arlington.—*H. C. Bate.*

Texas.—The mean temperature, determined by comparison of 43 stations distributed throughout the State, was 2.7° below the normal; it was about normal or slightly above over west Texas, while there was a general deficiency elsewhere ranging from 1° to 5°, with the greatest in the vicinity of Fort Ringgold; the highest was 108°, at Fort Ringgold on the 28th, and the lowest, 24°, at Amarillo and Rhineland on the 1st, and at Marathon on the 6th. The average precipitation, determined by comparison of 51 stations distributed throughout the State, was 0.10 below the normal. The rainfall was nearly normal, except over the southern portion of the panhandle, east Texas, and the southern portion of central Texas, where there was a deficiency ranging from 1.00 to 3.44, and the eastern portion of north Texas and the northern portion of central Texas, where there was an excess ranging from 1.94 to 2.68, with the greatest in the vicinity of Albany; the greatest monthly amount, 6.96, occurred at Runge, while none fell at Eagle Pass.—*I. M. Cline.*

Utah.—The mean temperature was 48.2°, or 0.5° above the normal; the highest was 90°, at Moab and St. George on the 9th, and the lowest, 11°, at Grover on the 20th. The average precipitation was 0.58, or 0.33 below normal; the greatest monthly amount, 1.54, occurred at Huntsville, and the least, trace, at Castle Dale, Cisco, and Pahreah.—*L. H. Murdoch.*

Virginia.—The mean temperature was 54.3°, or about 0.4° below normal; the highest was 95°, at West Point on the 15th, and the lowest, 16°, at Leesburg on the 3d and Burkes Garden on the 5th. The average precipitation was 1.94 or 1.36 below normal; the greatest monthly amount, 4.22, occurred at Wytheville, and the least, 0.21, at Clifton Forge.—*E. A. Evans.*

Washington.—The mean temperature was 47.0°, or 1.5° below normal; the highest was 80°, at Lind on the 15th, and the lowest, 18°, at Cedonia on the 13th. The average precipitation was 3.80, or about 0.50 above normal; in the western section it was about 1.50 above normal; the greatest monthly amount, 14.01, occurred at Clearwater, and the least, 0.7, at Moxee. The month was cold throughout, the temperature being the lowest of any April since 1896, and the spring the most backward since 1893. Farming operations have been greatly delayed, and crops have made poor progress.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 53.4°, or 1.2° above normal; the highest was 93°, at Morgantown and Uppertract on the 30th, and the lowest, 18°, at Beverly on the 5th. The average precipitation was 1.84, or 1.12 below normal; the greatest monthly amount, 3.17, occurred at Charleston, and the least, 0.92, at Oldfields.—*C. M. Strong.*

Wisconsin.—The mean temperature was 47.2°, or about 2.0° above normal the lowest temperatures occurred from the 1st to the 3d, and the highest from the 25th to 29th. The average precipitation was 2.42, or slightly below normal; the distribution was excellent.—*W. M. Wilson.*

Wyoming.—The mean temperature was 41.5°, or about normal; the highest was 92°, at Carbon on the 24th, and the lowest, 3° below zero, at Sheridan on the 1st. The average precipitation was 0.86, or 0.60 below normal; the greatest monthly amount, 2.30, occurred at Fort Yellowstone, while none fell at Cody and Wamsutter.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

SUN SPOTS AND HAWAIIAN ERUPTIONS.

By CURTIS J. LYONS (dated Honolulu, April 27, 1897.)

The following table showing the relation between the years of least sun spots, as actually observed by astronomers, and the dates of the more prominent volcanic outbursts on Hawaii certainly suggests some connection between the two. The sun-spot periods are from the United States MONTHLY WEATHER REVIEW for December, 1897:

Years of minimum sun spots.	Years of most important lava flows or eruptions.
(?)	1790 (Kilauea Keoua eruption.)
1799	1801 Hualalai.
1810	(?)
1823	1823 Mauna Loa.
1833	1832 Mauna Loa and Kilauea.
1843	1840 Kilauea. 1843 Mauna Loa.
1856	1852, 1855, 1859 Mean 1856, Mauna Loa.
1867	1868 Mauna Loa.
1878	1880-81 Mauna Loa.
1889	1887 Mauna Loa, south slope.
1900 (Probable)	....

The variation in number of sun spots during the average 11-year cycle is strongly marked, the ratio of maximum to minimum being about as 80 to 10, and sometimes greater. It is an accepted fact, I believe, that the solar heat is slightly greater when there are the fewest spots, but how this should cause volcanic outbreak does not appear. It may be the expansion, on account of solar heat, of a fluid interior breaking through a rigid crust.

The next minimum period is due about 1900, as near as can be estimated from past intervals, so without being in any way alarmists, it is reasonable for us to look for a probable lava flow at some time between now and 1901. The Hawaii lava flows are generally confined to desolate parts of the island.

This is not to be considered as a prediction but simply a statement of facts. The lava flows of Mount Ætna have followed, in a measure, the same period.

NOTE.—We publish the above note at the request of Mr. Lyons, but must call attention to the fact that if there be any causal connection, or any true chronological coincidence between the minimum sun spots and the important eruptions on Hawaii, then this relation should, also, be established by studying the agreement of the years of maximum sun spots with the years of no eruption. The above paper presents only one side of the question; the truth can only be attained by studying all sides, and by demonstrating that the eight approximations here quoted were not purely accidental. Everything points to an intimate connection between solar, terrestrial, and cosmic phenomena, but the nature and limitations of this connection can only be ascertained by a more elaborate study of such hypotheses as are implied in the above interesting note by Mr. Lyons.—ED.

A TALK ON ELEMENTARY METEOROLOGY.

By GEORGE MILLARD DAVISON, A. B.

[Given before the Teachers' Institute of Fulton County, N. Y., April 11, 1899.]

NOTE.—This present paper by Mr. Davison, principal of Gloversville High School, illustrates the general style of a popular lecture for teachers and scholars. The subject of meteorology is now being introduced into all the public schools as a necessary subject of instruction. The subjects touched upon in Mr. Davison's lecture before the Teachers' Institute of Fulton County would, of course, be treated more at length in several separate talks when the teachers present the matter to young pupils. The general object of such a lecture is to give the teachers briefs of points that must be elaborated in the class room. In the present crude condition of instruction in meteorology it is, of course, not to be expected that the most advanced physical theories with regard to atmospheric phenomena shall be presented to young pupils, or even that they should be understood by all the teachers. The subject must first be taught more thoroughly, both by the study of nature and of text-books, in the universities, colleges, and normal schools. Meanwhile elementary lectures, such as this by Mr. Davison, will serve as a model for plain talks to the children and their teachers.—ED.

In discussing the subject of meteorology, to-day, I shall not limit it to its commonly accepted meaning, as that which concerns the weather, but shall treat it in its general meaning as seen in the derivation of the word, namely, phenomena which have to do with air; nor shall I discuss obscure things, about which even scientists know comparatively little, but shall talk of ordinary phenomena, with which all are more or less familiar.

To the child all space seems empty, except that which is occupied by something he can see or touch, as houses, trees, rocks, etc. Air he does not see; but if you put into his hand a fan and ask him to wave it vigorously to and fro, he will discover that the fan meets with resistance which can only be overcome by the exertion of muscular effort on his part. In this way you can prove to him that air is a real, tangible substance. That it is made up of several different substances you can show by this simple experiment: If in a saucer partly filled with water I place a lighted candle and over it invert a tumbler so that the lower rim is slightly immersed in the water, the candle soon goes out. The fact that the water is drawn up into the tumbler shows that the volume of air has been diminished. If now I lift the tumbler carefully and put in a lighted match, the match goes out, showing that the tumbler contains a substance which will not burn nor support combustion. This is chiefly nitrogen. The other substance of which air is largely composed—that which enables fire to burn and which was exhausted when the tumbler was placed over the lighted candle—is oxygen. It is oxygen which, when taken into the lungs, cleanses the blood and thus supports life.

Several minor substances are also contained in air, the one of chief importance for our consideration is water in the form of invisible vapor. Its presence can be detected by means of crystals of calcium chloride. These crystals are very greedy of moisture, and when exposed in the air draw up the moisture to such an extent that they often liquify, thus proving the presence of moisture in the air. I have set some crystals of calcium chloride on the shelf under the clock which it might be well for you to notice later and see if they have undergone any change. Calcium chloride can be purchased at any drug store, but you must be careful to explain that you want what is known to chemists as calcium chloride, not that which is ordinarily known as bleaching powder, which is a chloride of lime. The entire space occupied by the atmosphere also contains moisture which exists at sometimes and in some places more densely than in others. At times the space becomes so completely filled with moisture that it can contain no more, and any further moisture is deposited in visible form on the window panes and woodwork of a room. When the atmosphere is in this condition it is said to be saturated. Let us suppose we had in this room a tub of water, so arranged that it will evaporate very slowly. If moisture is given off too fast it appears in the form of steam. If this slow evaporation be kept up long enough the air becomes saturated, and the moisture from the tub will finally become visible on the window panes and elsewhere. Or if we stop the evaporation before the air becomes quite saturated and lower the temperature a few degrees, we shall notice, if we watch the thermometer and observe the condition of the windows, the same result, i. e., that before the temperature has fallen very far the air becomes saturated and moisture is deposited. The temperature at which air will no longer contain its moisture is called the dew-point. Place a pitcher of ice water, preferably a metal one, in the moist air of a warm room. The ice cools the water and pitcher, which in turn cools the air in contact with it below the dew-point, so that some of the moisture in the room is deposited on the pitcher which is said to sweat. Let us apply this principle a little further. Suppose we transfer our thoughts to an evening in June. The day has been warm and the atmosphere is filled with moisture nearly to saturation. When the sun sets, the warm air rising from the earth gives place to cooler air. Heat is radiated or given off from objects on the surface of the earth. It leaves some objects more freely than others; grass gives off its heat most easily and is not otherwise warmed up, therefore, it is the first to cool below the dew-point. The air in contact with it having been cooled to saturation, deposits its moisture on the grass very early in the evening. You may prove this by walking through the grass with a pair of highly polished shoes soon after sundown. Dew forms on various objects in the order in which they radiate heat and fall below the dew-point, the list being, as you have it on the outline schedule of lectures, i. e., grass, wool, cotton, linen, silk, wood, earth, stone, metal.

If the night is a fairly cool one we find when morning comes that dew has formed on nearly everything in sight, small stones and pieces of metal being covered, and even the dust in the street is laid to a certain extent. Certain conditions prevent the formation of dew. A handkerchief or sheet spread over a grass plot or rose bush will prevent the radiation of heat from the objects covered, and the consequent formation of dew on them, though the upper surface of the handkerchief will be found wet. An open shed protects the ground and objects underneath from dew, and a clearly marked line can be found bounding the protected dry surface from that wet with dew. It may have been this that led the ancients to the general impression that dew falls as rain from the sky and the expression, "falling dew," although erroneous, is prevalent in all quarters at the present time. Let us be careful hereafter to speak of the forming, not the falling of the dew. We can readily see how in a similar way clouds act as a preventive of dew. Hanging low over the earth they form a covering that checks the radiation of heat and consequent falling of temperature below the dew-point, so that a cloudy night, generally speaking, is not a dewy one. This is also true of a windy night, for by constantly changing the air in contact with objects on the earth's surface before it has time to cool below the dew-point the wind prevents the deposit of moisture. A cool, clear, still night after a warm day is then most favorable for the formation of dew. The question why we fan ourselves may be interesting in this connection. The reason seems to be this: Air in contact with the surface of the body absorbs moisture or perspiration till saturated. Now when moisture in any visible form is changed to vapor, or the invisible form, heat is absorbed which in this case is taken from the human body, which always has an abundant supply. The body is thus cooled until the air in contact, being saturated, no longer takes up moisture and there is consequently no further absorption of heat. By bringing the fan into play the air next to the body is changed, and as the new supply, although nearly or quite as warm, is not saturated, the process of cooling is repeated, and can be kept up at will.

Closely connected with the subject of dew is that of frosts —one which may be made of great interest to the children. Let us imagine ourselves advanced to an October evening with the same conditions of a warm day and saturated atmosphere that prevailed on the June night just described. As the sun sinks low the temperature falls, dropping quite rapidly after sunset, until soon the dew-point is reached and dew begins to form on various objects, as in June. But the temperature drops lower and lower until the freezing point is reached and passed. Then much of the moisture that has been deposited congeals in beautiful crystal formations, and when we look out in the morning we see the earth covered with a coating of white frost. The difference between a white frost and a black one is that the former comes whenever a frosty night has a nearly saturated atmosphere to work upon, while the black frost occurs when the clear sky is favorable for frost, but the dry atmosphere lacks moisture. Black frost is usually more destructive than white frost, and kills plants by congealing their juices. A peculiarity of the earliest light frost of the season is that its effect is often noticed first in the lowest parts of valleys. A field of corn reaching down into a valley will be touched by frost at the lowest point, while the portion higher up will escape injury. This is due to the fact that cold air flows to the lowest possible part of the field and rests there. In this region the vegetation cools by radiation but receives no warm air currents, and therefore cools below the freezing point and is killed, while the warm air, rising to the higher parts of the field, serves to protect the plants in them.

Crystals are of interest when studying frost and its action. When any substance changes from the liquid or the gaseous to the solid state very slowly, thus giving the particles great freedom of motion, the molecules arrange themselves in a definite order about a common center, with their plane surfaces and edges symmetrically arranged about this center. Solids thus formed are called crystals, and ice crystals can be found in plenty on the window panes, where they are seen in various forms. The surface of a newly plowed field is a good place to find ice crystals. If this is not accessible, a corner of the school ground may be dug up, so that the loose soil will form a crystal bed, and be later utilized as a flower bed. Ice crystals can be studied to good advantage from a pan of water set in a freezing temperature if the freezing be arrested soon after it has commenced. The little needle-like crystals crossing each other on the surface may then be ex-

plained at leisure. The form of a star crystal may be cut from paper folded crosswise through the center and then folded fanwise along radial lines, and then cut diagonally across the fan. A five-pointed star will result if there are four radial folds. The child will enjoy making stars and looking for crystals like them. In doing this he will be led to notice others unlike them, and thus his knowledge of crystals will be extended. Ice is a mass of closely packed crystals. A child may sometimes ask why ice floats? Water expands when it freezes. Ten quarts of water will make about eleven quarts of ice, but the eleven quarts of ice will weigh no more than the ten quarts of water. Hence, a block of ice placed in sufficient water will float, about one-tenth projecting above the surface of the water. When we see a floating mass of ice or the picture of an iceberg we may recall that ten times as much ice is below as is seen above the surface of the water; the danger to a vessel in striking icebergs may thus be more fully realized.

It may occur to some one to wonder where all the moisture in the air comes from. That the earth is surrounded by a great envelope of air, called the *atmosphere*, we all know. Permeating this is another envelope, composed of invisible particles of moisture, which rise from water everywhere, and which spread in all directions, covering the earth. This is known as the *hydrosphere*. It is denser near the seacoast than in the interior mountainous regions. When we speak of the dry atmosphere of any place, we mean relatively dry, for nowhere is the air entirely free from moisture.

Pupils may be somewhat interested in tracing the path of a molecule of water from the earth to the sky and back again. The evaporation at any place can be noted by setting a vessel of water on the window ledge and protecting it from showers or birds. If the water be measured every day, the amount of evaporation in that particular vessel can be estimated. Let us then watch, in our imagination, a molecule as it leaves the pan in company with many others and is carried upward by warm air currents, which are constantly rising from the earth. Upon reaching a higher elevation, where the temperature is below the dew-point, the vapor becomes visible, and we say clouds have formed. Our molecule perhaps escapes and is carried up and down by various currents, losing its companions here and there, and, finally, at the highest cloud elevation, 5 miles above the surface of the earth, it becomes part of an ice crystal in the white, feathery cloud known as cirrus, familiar possibly to many as "cat's tail," "mare's tail," or, stretching across the sky, as "Noah's ark." From this lofty position our molecule can look down on the silver lining of the intermediate clouds, halfway to the earth, or, possibly, upon the lowest clouds, whose forms are more familiar to us. These we see from below on a warm summer day, when the cumulus, with its many heads, rises like a mountain range, or when the stratus appears, overcasting the entire sky. Another of the lowest clouds is the nimbus or rain cloud, which the wind often drives along so fast that its edges appear fringed, resembling hair blown about. Some of these pieces are torn off by the violence of the wind and are carried on before. These are called scud clouds. Our molecule does not continue to sojourn as part of the cirrus cloud, but when the surrounding vapor or upward currents no longer support the crystal in position it makes its way slowly toward the earth, falling in with warm air currents, which melt it, and at last finds itself a part of a saturated storm cloud near the earth, from which it falls in the form of rain. If it escapes the thirsty rootlets of vegetation, it makes its way between particles of earth to a lower stratum, through which it can not pass, and here, joined by others, it becomes part of an underground vein of water, which bubbles out on some hillside in the form of a clear, sparkling spring. Trickling out from the spring, it is borne on by the brook to the river, and thence to the sea, whence it will soon be again drawn up for another journey in the air.

Lightning and thunder often accompany a storm in summer, and about these the inquisitive child may desire to know. In defining lightning it is not necessary to tell him that it is a discharge between two clouds or a cloud and the earth; do not trouble him with unequal potentials, or opposite kinds of electrification. It will be sufficient to say that lightning is electricity, and he will enjoy the story of how Franklin established this fact. When lightning passes from cloud to cloud it seldom moves in a straight line, but rather in a zigzag path, and hence is called zigzag lightning. Sometimes it goes in sheets from one cloud to another and is then known as sheet lightning. Heat lightning, which we often see on a summer evening, is the reflection upon the clouds of far distant lightning flashes. Many children are afraid of injury during a thunderstorm. Such children may be reassured by the statement that not one person in three hundred thousand is struck by lightning, and that all danger from the flash which they see or whose thunder they hear is already past. The noise of thunder is caused by the flash of lightning forcing a hole or crack for its pathway through the air, which then rushes together again to fill the vacancy after the flash is over, thus causing a crash that reverberates against hillsides, giving us the long, heavy peal.

Another accompaniment of rain, and a pleasant one to consider, is the rainbow. Sir Isaac Newton's explanation will set pupils to thinking in the right direction, and will be of material assistance in the better understanding of the subject when they are mature enough to understand Thomas Young's diffraction theory. Three phenomena must be explained: First, the reflection of light. We are familiar with light reflected from a mirror, which is frequently illustrated by the small boy, who brings a piece of broken looking-glass to school and sends sunbeams dancing around the walls of the room. If a glass two-thirds full of water, containing a spoon, be held about one foot in front of the face with the bottom of the tumbler on a level with the head and you attempt to look up through the surface of the water, you will find that you see nothing except the reflection of the shank of the spoon. If, on the other hand, you hold the glass on a level with the eye or directly above the head, you can see through the water. But when you look through it at an angle the upper part presents a mirror-like, opaque surface which forms a perfect reflector. This illustrates the total reflection of light by water. A second phenomenon is the refraction of light, by which we mean the bending of the rays of light from the original path. This is caused by rays of light passing from a rarer to a denser substance or medium, as it is called (or vice versa). If I take a bowl, place in it a silver coin, and you take a position such that the coin just becomes invisible over the edge of the bowl, you will observe as I proceed to fill the bowl with water, being careful not to move the coin, that you can now see it. This is because a ray of light passing from the coin to the eye is bent or refracted at the surface of the water, and is thus enabled apparently to pass over the edge of the bowl. If at the point at which a ray of light passes from one medium to another a line be drawn perpendicular to the surface of the two objects, this line is called the normal, and it can be observed that light passing from the denser to the rarer medium is bent away from the normal while that passing from a rarer to a denser medium is bent toward the normal. The third phenomenon to be noted is that of the prismatic spectrum. When a ray of white light passes through two inclined surfaces of a prism (a three-sided bar of glass) it is refracted and so broken up that we can see the original colors of which the light was composed. All these colored rays are refracted differently, the red least and the violet most of all, and between these the

other colors in proportion. Let us apply these facts to the rainbow. In order to see a rainbow the observer must stand between the sun and the falling shower. The side of the raindrop toward the sun is completely covered by rays, some of which pass directly through the drop while others after entering it are reflected to the eye of an observer standing as indicated at D or E in the diagram.

In Fig. 1, let the circle represent the outline of a rain drop with a ray of light entering at point A. It is refracted on entering the denser medium toward the normal AB, and is also broken up into parts of which the line AR represents the red ray, and AV the violet. These two rays are equally reflected and emerge from the drop at R′ and V′ where they are again refracted, the violet more than the red ray. To an observer standing with his eye at point O there appears to be a red spot in the sky coming from the point where the red ray leaves the water drop while the violet ray passes over his head. But the violet ray from a lower drop enters the eye, and the observer at O will see a violet spot in the sky below the red spot. This is shown in Fig. 2, where two drops are represented as reflecting and refracting the sunlight SR, SV, so that the red ray from the upper drop and the violet ray from the lower drop enter the eye of the observer at E. All the drops on the lower curved edge of the rainbow, BB, send violet rays to the same point, giving the impression of a violet arc in the sky, while all drops on the upper curved line send red rays to the eye, and there appears to be a red arch parallel to the violet one. In between these in proper order are arranged the other colors of the spectrum. But there are other rays entering the drop beside those that enter its upper side. Let us take a ray entering the drop on the lower side, as in Fig. 3. The ray of light, SA, is refracted and broken into the red ray, AR, and the violet, AV, the latter being, as always, refracted most. These are reflected twice by the side of the drop, whence they emerge again refracted at R″O′ and V″O′ with the consequence that the violet ray is below. Now, to an observer standing with the eye at O, a violet light would appear at a point in the sky occupied by this drop, while the red ray R″O′ would pass over his head. From another drop situated at a proper distance below a red ray would appear, thus giving the impression of a red spot below the violet. This is again shown in Fig. 2. The upper drop of water receives rays from the sun, refracting and reflecting these rays as just described, so that the violet rays enter the eye of an observer at E, the drop below this sends him red light, and in the same way the red and violet circles of light appear with the other colors of the spectrum arranged in between. In this rainbow the red color is on the inside and the violet on the outside. In the one first described the colors were reversed. Notice also another difference. In the bow last described there are two reflections within each drop of water, and as some light is absorbed at each reflection this rainbow is dimmer than the other, where there is but one reflection. The brighter bow is called the primary, the other is called the secondary bow.

Most children have observed the echo, or if they have not yet done so, will be much interested in it. As light striking a mirror is reflected, so sound, striking against any flat obstacle, as a cliff, forest, or wall, rebounds. It will be necessary to show that sound consumes an appreciable time in traveling. This can be done by watching a wood chopper as far off as the blows of the axe can be heard. Point out the fact that the sound made when the axe strikes does not reach the ear until the axe has again been lifted in the air for the next blow. A steam whistle also illustrates this very nicely, because its sound is carried so far that the child may be stationed at a point so very far distant that the steam can be observed leaving the whistle sometime before the sound reaches the ear. Consequently it will be quite evident that when traveling straight from its source to the observer, sound consumes some time in its journey. When it is reflected, as in the echo, it follows a longer path and consumes still more time in reaching the ear. When the child comes to understand quite clearly that sound re-

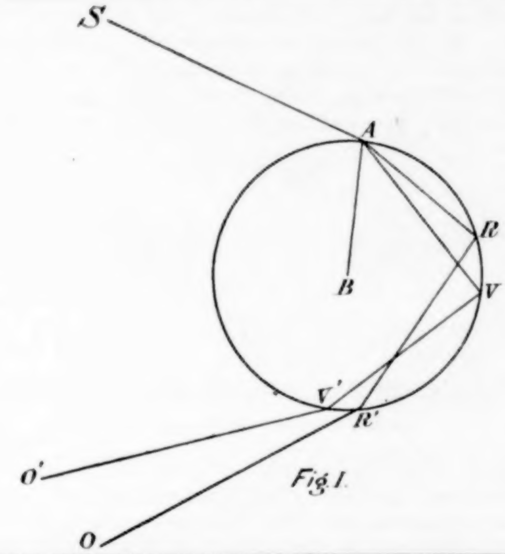


Fig. I.

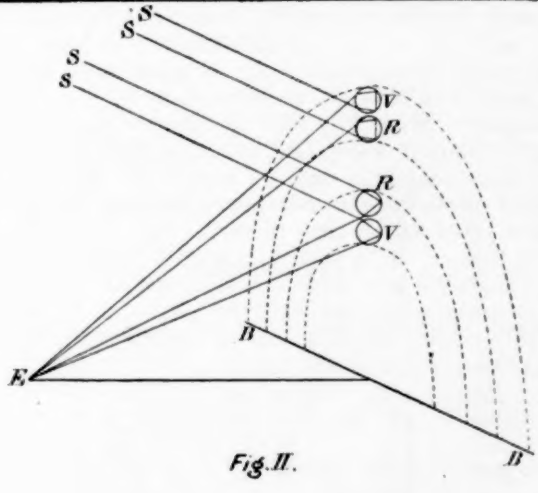


Fig. II.

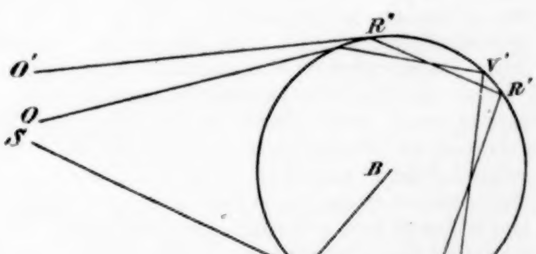


Fig. III.

quires time to traverse space, he can be taught, when a little older, that light also requires time to travel, and that the steam from the whistle was seen before the sound was heard, because the light traveled so rapidly that the time it took had no appreciable value as compared with that required by the sound.

A child is especially interested in anything that he does himself. A daily weather record kept by each pupil can be made helpful in teaching him valuable habits of observation. The following form shows a simple plan for keeping such a record; you can make it more or less complete as you choose:

WEATHER RECORD.

Days of week.	Temperature.	Sky.	Winds.		Weather and precipitation.
			Velocity.	Direction.	
Monday.......	....	....	....	....	....
Tuesday......	....	....	....	....	....
Wednesday ..	....	....	....	....	....
Thursday. ...	....	....	....	....	....
Friday........	....	....	....	....	....

A good time for taking the observations is at the afternoon recess, and these should be placed on record on a sheet of paper by the teacher or older pupils. The records, after being kept for a week may be filed away to be brought out a month later and compared with the record kept at that time. A serviceable thermometer can be purchased for twenty-five cents, and from this the children may be taught to read the temperature. Some boy will be clever enough to construct a simple weather vane, and after ascertaining the points of the compass the child can be taught to describe the winds, which are named north, northeast, east, etc., according to the direction from which they blow.

WINDS.

Name.	Velocity, miles per hour.	Visible effects.
Calm	0	No visible motion.
Light.................	1-2	Moves smoke from the vertical.
Gentle................	3-5	Moves leaves of trees.
Fresh	6-14	Moves small branches and stirs dust.
Brisk	15-24	Makes white caps on open water.
High..................	25-39	Sways trees and breaks small branches.
Gale..................	40-59	Dangerous for sailing vessels.
Storm	60-79	Prostrates exposed trees and small houses.
Hurricane...........	80 or more.	Prostrates everything.

This table describes winds accurately enough for our purpose, so there can be entered on the record the velocity as well as the direction of the wind. The sky is clear when there are no clouds, or cloudy when entirely overcast. The kind of precipitation, as rain, snow, or hail can be recorded, and if it seems desirable, a rain gauge for measuring the amount may be constructed according to directions to be obtained from the nearest Weather Bureau station.

The weather map issued daily by the Weather Bureau of the Department of Agriculture is one of the triumphs of modern science, but it would be impossible without the telegraph. The observations are taken at the weather stations all over the country every morning and evening at 8 o'clock, eastern standard time, which out on the Pacific coast means 5 o'clock. Within twenty minutes the data have been collected and telegraphed to Washington, such messages having the right of way over all others. There the data are collated and the necessary information is sent to the offices where maps are printed. If you will glance at this map that I have hung up before you, you will notice a heavy red line beginning down near Galveston, Tex., and extending around to Cape Hatteras. This is called an isobar and connects places having the same barometric pressure. A little to the left of this is another curve, and you will notice that the figures at the end indicate a pressure of one-tenth of an inch less than at the first. For every variation of a tenth of an inch in the reading of the barometer there is a different isobar. Within the second curve are two others, the inner one of which forms a complete ellipse. In the center of this, near Nashville, you read the word "Low." This means that at that place the barometric pressure is the lowest in all that territory. Looking off to the northwest you will find other isobars which, if the lines were completed, would extend up into British America. Each one of these registers a tenth of an inch higher until you come to the last curve, within which is the word "High." There the barometric pressure is highest.

The accompaniment of the low-pressure area is warm, cloudy, windy weather, with possibly rain or snow. Still, clear, cold, invigorating weather is the accompaniment of the high. Highs and lows drift across the United States in an easterly direction, with an interval between them of about three days or more. Wind always blows from the high toward the low, but not directly. The map shows that the arrows, which indicate the direction of the wind, point from the high toward one end of the low-pressure area. The wind blows to one side of the center in such a way that it circles around the low in a direction opposite to that of the hands of a clock lying face upward on the map. This great circle of winds, moving with more or less velocity, is called a cyclone, and the term is used improperly if applied to any other wind phenomena. The cyclone is not to be confused with the tornado. The latter is only a few hundred feet in width; the cyclone is many miles in diameter. If through the center of the low-pressure area a north-south and an east-west line be drawn intersecting each other, and the temperature in each quarter be averaged, you will find that it is coldest in the northwest section, warmer in the southwest, warmest in the southeast, and cooler again in the northeast. The cyclone transfers heat from quarter to quarter around the low, and thus tends to equalize the temperature. Sometimes it does more than this. During the period when the States in the northwest suffer from a severe cold wave, an area of exceedingly low pressure with a brisk cyclone will carry the extreme cold in an unusual degree southeastward over the southern States. The Weather Bureau, by its study of these facts, can foretell the approach of destructive frosts in time to have all possible precautions taken. The weather map also gives much more information. The arrows are attached to circles, whose centers indicate clear, fair, cloudy, or stormy weather. The dotted lines connecting points of like temperature are called isotherms. At each weather station the temperature is observed with both a wet and a dry bulb thermometer. The dry bulb temperature is that which is read on all ordinary thermometers; the wet bulb temperature is that taken with wet muslin wrapped about the bulb of the thermometer, and is the temperature of evaporation, and is more nearly that which we actually feel, because it is taken under conditions similar to those which exist about the human body when moist with perspiration. Precipitation, in inches, and the velocity of the winds, in miles per hour, are indicated on the map by figures which should be studied carefully.

The Weather Bureau has kindly consented to furnish free to teachers a copy of the weather map daily, for use in the schoolroom, during the months of the school year. As the regular price is $3 per year, this offer is a very generous one, and it is to be hoped that many will take advantage of it.

The Weather Bureau official at Albany, N. Y., Mr. A. F. Sims, has asked me to extend to the teachers of this State a cordial invitation to visit the Albany office and inspect the apparatus and observe the methods pursued.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made nearly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological observations at Honolulu.

APRIL, 1899.

The station is at 21° 18′ N., 157° 50′ W.
Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.
The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force or amounts of cloudiness, connected by a dash, indicate change from one to the other.
The rainfall for twenty-four hours is now given as measured at 1 p. m. Greenwich time on the respective dates.
The rain gauge, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2:30 a. m., Honolulu time, of the respective dates. ‖									
				Temperature.		Means.		Wind.				Sea-level pressures.	
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.	Total rainfall.	Average cloudiness.	Maximum.	Minimum.
	*	†	†			‡	‡		§				
1	30.00	72	63.5	80	72	62.0	62	ne.	3	0.00	3	30.13	30.03
2	29.98	69	64.5	81	71	60.7	62	ne.	3-1	0.00	2	30.06	29.96
3	29.98	70	64	80	67	62.3	70	ne.	3-1	0.01	2	30.04	29.96
4	29.96	71	65	81	68	62.3	66	ne.	2	0.04	4	30.03	29.96
5	29.96	72	65	79	68	63.7	72	ne-nne.	2-4	0.01	3	30.03	29.95
6	29.95	71	65	80	70	61.7	65	ne.	2-4	0.08	4	30.03	29.94
7	29.98	68	64	79	69	63.3	69	nne.	4	0.13	6	30.03	29.94
8	30.06	68	63	74	66	58.0	64	nne.	0-6	0.04	5-2	30.06	29.95
9	30.05	68	60	73	66	60.0	71	ne-n.	5-2	0.12	8	30.12	30.04
10	30.08	70	63	76	66	55.7	58	nne.	5	0.00	4	30.15	30.07
11	30.05	70	63.5	79	69	58.7	62	ne.	4	0.04	5	30.15	30.07
12	30.07	70	65	79	66	61.5	67	ne.	3	0.01	3	30.12	30.03
13	30.05	72	64	80	68	62.7	69	ne.	3	0.01	4	30.13	30.06
14	30.05	71	64	81	70	58.5	58	nne.	3	0.07	2	30.11	30.03
15	30.06	71	63.5	78	67	61.0	65	ne.	3-5	0.16	7	30.11	30.04
16	30.10	72	65	79	67	60.5	62	ne.	5	0.01	5	30.14	30.06
17	30.08	71	64.5	77	70	61.7	68	ne.	4	0.06	5	30.15	30.07
18	30.00	71	64	79	69	60.7	64	ne.	4-5	0.01	4	30.12	30.01
19	30.00	71	63.5	80	70	60.7	63	nne.	4	0.00	3	30.05	29.98
20	29.98	62	61	79	70	62.0	69	ne.	3	0.15	3-8	30.06	29.98
21	29.91	61	58.5	81	61	62.3	73	w.	1-0	0.00	2-6-0	30.03	29.95
22	29.89	63	61	79	59	60.0	74	w-s.	1-0	0.00	0-6	29.97	29.87
23	29.85	64	62	78	61	60.7	73	sw.	1-0	0.00	3	29.93	29.84
24	29.85	71	66	80	61	61.7	71	sw-s.	1-0	0.01	2	29.90	29.83
25	29.93	71	67	82	65	64.3	70	se.	1	0.06	8-3	29.98	29.88
26	29.98	69	67	82	69	66.0	74	nne-s.	3-0	0.00	6	30.03	29.95
27	29.98	72	68	81	66	66.5	75	se.	1-0	0.00	9	30.04	29.97
28	29.99	71	69	80	67	67.3	77	e-s.	1-3-0	0.05	8	30.05	29.95
29	30.00	69	66.5	79	67	66.7	76	se.	1-0	0.00	8	30.02	29.96
30	30.04	70	67	82	66	66.0	74	sw-e.	1	0.00	3-8	40.07	30.00
Sums	......	......	......	......	......	......	......	....	.....	1.07	.....	......	......
Means	29.995	69.3	64.2	79.3	67.0	62.0	68.1	....	2.6	....	4.7	30.061	29.978
Departure	0.000	......	......	......	......	—1.3	—3.5	....	.....	—1.94	.....	......	......

Mean temperature for April, 1899 (6+2+9) + 3=72.7°; normal is 72.8°. Mean pressure for April is 30.015; normal is 30.018.
* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (6+9+2+9) + 4. § Beaufort scale.
‖ Possibly this record is for 9 a. m., Honolulu time.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletin Mensual*. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for April, 1899.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Colima	1,600	28.26	92.8	54.1	78.1	65	T.	sw.	sw.
Culiacán Rosales (E. d. S.)	112	29.73	93.2	53.6	77.9	54	......	w.	n.
Durango (Seminario)	6,243	27.96	91.4	38.1	66.2	35	......	sw.	w.
Leon (Guanajuato)	5,934	24.27	92.1	45.3	70.2	29	0.04	sw.	sw.
Linares (N. Leon)	1,188	28.67	102.2	50.0	74.3	59	1.97	sse.	sse.
Mexico (Obs. Cent.)	7,472	23.04	87.6	39.2	63.5	39	0.12	nw.	sw.
Morelia (Seminario)	6,401	23.95	86.9	46.6	65.8	48	T.	sw.	w.
Puebla (Col. Cat.)	7,112	23.33	84.2	39.2	66.0	60	0.38	e.	wsw.
Queretaro	6,070	24.18	94.6	43.2	67.6	39	0.18	e.	....
S. Isidro (H. de Guanajuato)	......	......	82.4	62.6	......	......	T.	w.	....
Siloa	6,063	24.25	87.4	52.9	71.2	45	T.	sw.	w.
Tuxpan	19	30.03	105.4	54.0	77.9	42	0.79	e.	s.
Zapotlan (Seminario)	5,078	25.09	87.6	45.1	70.7	61	0.01	se.	w.

LONG-RANGE WEATHER FORECASTING IN CANADA.

By JAMES GUN, Durham, Ontario, Canada.

In the concluding portion of a very interesting article on Recent Science in the March number of the Nineteenth Century, Prince Kropotkin asks the question, whether it is possible to foretell the weather several days, or maybe weeks, in advance. Popular wisdom, he adds, has always said yes to this question, and remarks, that—

When the Greeks say that the autumn and winter months are months of gales, or the Northwest Canadians predict a spell of warm and dry weather after a snowstorm of short duration has blown early in autumn, or the Russian peasants remark that, when the first snow has fallen upon an already frozen ground, the snow will lie late in the spring, that the spring will be cool, there is scientific observation in such prophecies, and that recent researches have decided in favor of these practical observers.

I take the liberty of bringing before your readers another weather period. The opinion of the early Canadian settlers, and one that would seem to deserve further investigation, was that the general direction of the wind at the equinoxes (in consequence the general state of the weather as to heat and moisture, cloud and sunshine, etc.) indicated the general condition of the weather during the following three months, respectively.

As a contribution to the elucidation of what modicum of truth there may be in this method of forecasting the weather by the Canadian voyageurs, I have tabulated below, the direction of the wind at the equinoxes from 1895 downward, and the number of days following such equinox, during which the wind blew in the same general direction. Temperature and precipitation might be given also, but at this time I will refrain from troubling your readers with any further details.

Equinoxes.		No. of days the same wind prevailed during the next three months.
Date.	Direction of wind.	
1895.		
March 21	se.	50
Sept. 22	sw.	65
1896.		
March 21	nw.	27
Sept. 22	n.	23
1897.		
March 21	ne.	45
Sept. 22	se.	34
1898.		
March 21	se.	50
Sept. 22	sw.	58

NOTE.—The figures given in this table seem to show that during ninety days following the March equinox the prevailing wind was that required by the rule on 172 out of 360 oc-

casions. For the September equinox the agreement was 181 out of 360. The southeast and northwest winds in this region of the continent are by far the most frequent of all that occur, but the preceding figures show that the equinox does not appreciably control the wind.—ED.

CLIMATE AND CROP SERVICE PUBLICATIONS.

By JAMES BERRY, Chief of Climate and Crop Division.

Soon after the present Chief of the Weather Bureau assumed charge of the service he set about to accomplish what had long been considered most desirable and important in connection with the publication of the climatological data collected through the various State weather services in cooperation with the National Weather Bureau, viz, the issue of the monthly reports in a uniform style after an approved pattern. The monthly reports of the various State weather services up to 1896 were printed by the stencil plate and milliograph process. They were inelegant in appearance, of various forms and sizes, lacked agreement in arrangement and character of the data, and in only one or two cases contained graphic illustrations of meteorological conditions.

In January, 1896, the Chief of Bureau, desiring to emphasize the distinction between the terms climate and weather, as also the fact that the Weather Bureau and not the respective States was responsible for the work, announced in official instructions that the division formerly entitled State Weather Service, having charge of the local services, should be designated the Climate and Crop Division, and that each local service should be known as a State Section of the Climate and Crop Service of the Weather Bureau. Careful attention was devoted to the matter of designing a model form of publication for all sections, and the one adopted was of the size of the general MONTHLY WEATHER REVIEW. It provided for tables containing current means and normals of temperature and precipitation, extremes of temperature, altitude of stations, daily readings of maximum and minimum thermometers and daily precipitation for all stations, charts of temperature and precipitation, and several pages devoted to a general discussion of the various meteorological elements and miscellaneous weather phenomena.

The first report according to the new model was that for February, 1896, for the New England section, issued at Boston. Pennsylvania followed in the succeeding month, and as quickly as possible other section reports were issued after the adopted standard. Many difficulties lay in the way of making the section reports uniform, even where the necessary means for printing were available, as several States had by legislative enactment provided for the printing of the reports of State Weather Services, and the State directors were not all disposed to depart from the form in which their previous reports had been issued. By the close of 1897, however, nearly one-half of the sections had adopted the new model, and by October, 1898, all were issuing reports uniform in size, while the arrangement of data was identical in all but two, these exceptions being New York and Iowa, the reports of which, although differing slightly in minor details, contained the same information.

At the present time the Climate and Crop Service of the Weather Bureau is divided into 42 sections, independent of those for Porto Rico and Cuba. Therefore, 42 quarto publications are issued every month, containing accurate and detailed reports of observations made daily throughout the year at more than 3,000 voluntary stations. Not only has the form of the publication been standardized, but the instrumental equipment of the voluntary observers and the exposure of the instruments have received most careful attention. Nearly all voluntary observers are now supplied with instruments of the most approved pattern, and during the past two years a large proportion have been supplied with approved thermometer shelters.

The monthly editions of the section reports for the various States range from 300 to 3,000 copies. These are distributed to cooperating observers, scientific institutions, libraries and newspapers, each section center receiving and carefully preserving the reports for all other sections.

A file of these reports supplies a vast fund of meteorological information for the purposes of study and investigation.

The work of establishing Climate and Crop Sections in Porto Rico and Cuba is well advanced, an ample number of instruments to equip a complete system of stations having been sent into these islands. About 30 stations have already been established in Porto Rico, where the issue of weekly Climate and Crop Bulletins was begun in January of this year. At an early date the monthly report of the Porto Rico section in the standard form is expected. In Cuba the conditions have been less favorable for this work, but much progress has been made, and no doubt before the close of the year both weekly and monthly reports after the standard type will be issued for that island also.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Meteorologische Zeitschrift, Wien, Band 16.
Satke, L. Fünfjährige Beobachtungen der Temperatur der Schneedecke in Tarnopol. P. 97.
Westman, J. Täglicher Gang der resultirenden Luftströmung an der Erdoberfläche zu Upsala 1891-1895. P. 107.
Maurer, J. Einige Ergebnisse der sechsten internationalen Ballonfahrt am 3 Oktober, 1898. P. 110.
Bezold, W. v. Bemerkungen zu der Abhandlung des Herrn. "Ueber Spät- und Frühfröste." P. 114.
Supper, K. Resultat der meteorologischen Beobachtungen in der Republik Guatemala im Jahre 1897. P. 117.
Tippenhauer, G. Ueber die Ursache der doppelten täglichen Oscillation des Barometers. P. 120.
——Ergebnisse der meteorologischen Beobachtungen auf dem Mont Ventoux im Jahre 1897. P. 123.
——Resultate der meteorologischen Beobachtungen in Buëa am Kamerun-Gebirge. P. 123.
Davis, W. M. "Helm Wind" Beobachtet in den Cevennen. P. 124.
Madsen, C. L. Ein Beitrag zur Erklärung von abnormalen Temperaturverhältnissen im nördlichen Europa. P. 125.
——Blitzschäden im Jahr 1897 in Steiermark, Kärnthen und Oberkrain. P. 128.
Prohaska, K. Ueber die Fortpflanzungsgeschwindigkeit der Gewitter in Steiermark, Kärthen und Oberkrain. P. 129.
Hegyfoky, J. Bemerkung zu dem Referate "Hegyfoky, J., Wasserstand der Flüsse und Niederschlag in Ungarn." P. 130.
Hann, J. Der Charakter der Winter der letzten 70 Jahre in Wien. P. 132.
——Temperatur und Luftdruck-Mittel für Tokio. P. 134.
——Täglicher Gang des Barometers zu Sao Paulo. P. 136.
Harrington, M. W. Mittlerer Regenfall in San Juan de Porto Rico. P. 135.
——Meteorologisches aus Bolivien. P. 136.
Fischer, F. Erwiderung. P. 131.
Sitzungsberichte der k. p. Akad. der Wiss. zu Berlin. 1899.
Ludeling, G. Ueber den täglichen Gang der erdmagnetischen Störungen an Polarstation. P. 236.

La Nature, Paris, 27 année.
Dupont G. Brulot auto-allumeur pour la protection des récoltes. P. 319.
Leotard, Jacques. L'Observatoire de Zi-Ka-Wei. P. 342.
Scientific American Supplement, New York.
Peckman, W. C. Liquid air and its Phenomena. P. 19504.
Proceedings the Royal Society. London. Vol. 64.
Fitzgerald, M. F. On Flapping Flight of Aeroplanes. P. 420.
Symons Meteorological Journal. London. Vol. 34.
Winter Minima [Temperature] on British Mountain Tops. P. 33.
Negretti and Zambra's Self-recording Rain Gauge. P. 36.
Appleton's Popular Science Monthly, New York. Vol. 55.
Remsen, Ira. Liquid Air. P. 35.
Engineering Magazine, New York. Vol. 17.
Thomson, Elihu. Possibilities of Liquid Air. P. 197.
National Geographic Magazine, Washington. Vol. 10.
Leiberg, J. B. Is Climatic Aridity Impending on the Pacific Slope? Testimony of the Forest. P. 160.
Nature, London, Vol. 59.
MacDowell, A. B. Sunspots and Rainfall. P. 583.
——Wireless Telegraphy. P. 606.
Fitzgerald, F. Flight of Birds. P. 609.
H. B. Theory of the Rainbow. P. 616.
Ciel et Terre, Bruxelles. 20 année.
Spring, W. Sur l'unité d'origine du bleu de l'eau. P. 81.
Zenger, Ch. V. Climat de la Belgique en 1897 et la période solaire. P. 108.
——Dépression au centre du continent asiatique. P. 119.
Sitzungberichte der Akad. Wiss. zu Berlin. Band 16, 1899.
Bezold, W. v. Ueber die Zunahame der Blitzgefahr während der letzten 60 Jahre. P. 291.
Aeronautical Journal. London. Vol. 3.
Bacon, J. M. The Balloon as an Instrument of Scientific Research. P. 29.
Biddle, D. Method of Steering Balloons during Ascent and Descent. P. 37.
Hugo, T. N. How Birds Fly. P. 38.
Mossman, R. C. Wind Averages. P. 42. (From J. Roy. Met. Soc.)
Quarterly Journal Roy. Met. Soc. Vol. 25. 1899.
——Wind Force Committee. Exposure of Anemometers at Different Elevations. P. 1.
Wilson-Barker, D. Comparison of Estimated Wind Force with that given by Instruments. P. 13.
Marriott, W. Tornado at Camberwell, October 29, 1898. P. 19.
Carpenter, A. West Indian Hurricane, September, 1898. P. 23.
Dines, W. H. Connection between the Winter Temperature and height of the Barometer in northwestern Europe. P. 32.
Hann, J. Theory of the Daily Barometric Oscillation. P. 40.
Geographical Journal. London. Vol. 13. 1899.
Thoroddsen, Th. Explorations in Iceland during the years 1881–1898 (conclusion). P. 480. [Meteorological data. P. 495.]
——Bulletin of the American Geographical Society. New York. Vol. 31. 1899.
Gannett, H. The timber line. P. 118.
Ward, R. DeC. Notes on climatology. P. 160.
Libbey, W. Notes on oceanography. P. 163.
Naturwissenchaftliche Rundschau. Braunschweig. April, 1899. Vol. 14.
Bacon, J. M. Ueber den Werth von Beobachtungen, die man vom freien Ballon ausmachen Kann. P. 213.
Zeitschrift für Luftschiffart und Physik der Atmosphäre. Berlin. Vol. 18.
Loessel, F. R. von. Aërodynamische Schwebezustand einer dünnen Platte und deren Sinkgeschwindigkeit nach der Formel

$$V = \sqrt{\frac{gs}{r\,(F + bv)}}$$ (Fortsetzung). P. 25.

Steffen, K. Zur Spannungs-Theorie. P. 31.
Dientsbach, Karl. Ueber Luftwiderstand. P. 38.
Trabert, W. Was erwartet die Meteorologie vom Registrierdrachen? P. 50.
Zeitschrift für Instrumentenkunde. April, 1899. Vol. 9.
Sprung, A. Ueber den photogrammetrischen Wolkenautomaten und seine Justirung. P. 111.
Physical Review. New York. Vol. 8.
Waidner, C. W. and Mallory, F. Comparison of Thermometers. P. 193.
Himmel und Erde. Berlin. 11 Jahrg.
Scheiner, J. Nachtrag zu die Temperatur der Sonne. P. 323.
Archives des Sciences Physiques et Naturelles. Génève. 4me série. Vol. 7.
Spring, W. Sur l'origine du bleu du ciel. P. 225.

NORMAL PRECIPITATION IN THE REGION OF THE GREAT LAKES.[1]

By ALFRED J. HENRY, Chief of Division.

We present elsewhere a chart[2] of normal annual precipitation of rain and snow in the drainage basins of the Great Lakes. The outlines of the different drainage basins were drawn from the excellent map published in Report of the United States Deep Waterways Commission, House Doc. No. 192, 54th Congress, 2d Session. The precipitation data were obtained from the files of the United States Weather Bureau and the Meteorological Service of the Dominion of Canada.

The distribution of precipitation and its relation to the fluctuations of the surface level of the lakes are subjects of much importance. While we are able to present a fairly accurate chart of the normal distribution of precipitation, and to give figures which show the amount of rain and snow that has fallen in the several drainage basins during the last six months, we should not be too hasty in drawing conclusions therefrom.

The rain that falls on the ground may be disposed of in several ways. A considerable portion, say from 33 to 50 per cent, may run into small streams and rivers, and thence into the Lakes, and it is this portion, called for convenience the runoff, with which hydrographers are chiefly concerned.

The allied questions of rainfall and runoff, in their bearing upon the design and construction of sewerage systems, have received a good deal of attention of recent years from civil and municipal engineers. The National Government, also, in dealing with the reclamation of arid and subarid lands, has investigated to some extent, the amount of runoff in various parts of the country, and a preliminary map of the results has been prepared by Messrs. Gannett and Newell of the U. S. Geological Survey. This map shows the runoff in the Lake region to be rather large, approximating 50 per cent of the total rainfall in the lower peninsula of Michigan. For the entire region, however, it is somewhat less. It does not seem possible with our present knowledge of the surface conditions to estimate the runoff for each basin separately.

The normal annual precipitation of the several basins, giving equal weight to all of the available records, is about as follows:

	Inches.
Lake Superior	28
Lake Michigan	33
Lake Huron	32
Lake St. Clair	35
Lake Erie	36
Lake Ontario	33

These figures agree closely with those used by Professor Abbe, MONTHLY WEATHER REVIEW, April, 1898, except in the case of Lake Superior, for which he uses a value of 31.2 The records, whence my figures were obtained, especially for the Canadian side, are more complete than those consulted by Professor Abbe.

The lakes themselves, with the possible exception of Lake Superior, do not seem to have a very marked influence on the precipitation of moisture on adjacent land areas. Precipitation is greater on the south than on the north side of Superior, Erie, and Ontario—lakes whose longer axes run approximately east and west. The difference in the case of Superior is about 8 inches, the average annual precipitation on the American side being that much greater than on the Canadian side. The average precipitation on the south shores of Lakes Erie and Ontario is about 3 inches greater than on the north shores. Precipitation is greater on the eastern

[1] Reprinted from Meteorological Chart of the Great Lakes, June 3, 1899.
[2] Not reproduced.

shores of Lakes Michigan and Huron than on the western, although the differences are not so strongly marked as between the northern and southern shores of the remaining lakes.

There is a slight diminution in the annual precipitation over the northern peninsula of Michigan as compared with the immediate shore line. The precipitation of the interior of the upper half of the lower peninsula is also considerably less than on the borders of the lakes on either side, a fact which can probably be referred to the influence of the lakes.

Precipitation, in inches and hundredths, November, 1898, to April, 1899.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal annual.
Lake Superior Basin.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Savanne, Ont	2.00	0.60	1.50	1.80	1.00	0.75	
Port Arthur, Ont	0.77	0.28	0.50	0.57	0.34		22.66
Schreiber, Ont	1.80	0.70	0.80	1.40	1.80	2.45	
Heron Bay, Ont	2.12	1.87	1.80	1.38	2.90	1.90	
White River, Ont	2.02	2.09	1.49	1.72	1.58	2.40	23.25
Missanabie, Ont	1.47	1.50	3.00	1.10	3.10	1.77	26.51
Two Harbors, Minn			0.64	0.61	0.69	3.19	
Duluth, Minn	0.94	0.19	0.67	0.66	0.82	1.33	31.01
Thomaston, Mich	2.66	2.84	1.80	0.40	2.80		
Ewen, Mich	1.10		1.70	0.75		3.47	
Calumet, Mich	2.57	3.07	2.61	1.34	1.08	2.49	31.11
Baraga, Mich			1.70	0.82	2.90	1.45	
Sidnaw, Mich		0.68	1.94	1.67	2.28	1.64	
Ishpeming, Mich	1.53	1.46	2.34	1.01	5.49	2.63	
Marquette, Mich	1.79	1.52	1.64	0.53	2.79	2.60	32.37
Lake Michigan Basin.							
Lathrop, Mich	0.75	0.60	1.90	1.00	2.75	1.45	30.69
Florence, Wis	1.12	0.15	1.35	0.85	3.66	4.19	
Powers, Mich		0.35	1.57	0.70	2.40		
Escanaba, Mich	1.39	0.43	1.48	1.03	2.22	3.26	32.46
Manistique, Mich	1.48	1.07	1.45	0.95	2.72	3.00	
St. Ignace, Mich	1.95	0.50	1.63	0.72	1.86	1.54	
Wausaukee, Wis	1.10	0.30	0.75	0.60	1.85		
Antigo, Wis			0.60	0.80	1.70		
Stevens Point, Wis	1.15	0.50	0.90	0.90	1.15	3.86	
Showano, Wis	1.23	0.38	1.70	1.20	2.32	2.55	
Amherst, Wis	1.70	0.81	1.30	1.10	2.50	2.76	
New London, Wis	1.06	0.46	1.04	1.13	2.88	2.89	
Oconto, Wis	1.95	0.40	1.45	0.65	2.22	2.53	27.58
Green Bay, Wis	0.87	0.74	0.98	0.96	2.93	3.15	32.30
Menasha, Wis	0.77	0.59	1.07	0.41	1.79	2.98	
Chilton, Wis	0.38	0.30	0.90	0.45	1.20	1.90	
New Holstein, Wis		0.10	0.70	1.00	2.25	1.05	
Manitowoc, Wis	0.65	0.62	0.83	0.98	1.84	1.67	31.09
Oshkosh, Wis	1.75	0.46	0.75	0.55	1.45	3.50	
Fond du Lac, Wis	1.29	0.51	0.60	0.97	1.56		
West Bend, Wis			T.	T.		1.86	
Port Washington, Wis	1.37	1.20	0.40	0.70	2.45	1.68	
Waukesha, Wis	0.98	0.50	0.64	0.77	1.47	1.19	
Milwaukee, Wis	1.16	0.58	0.45	0.75	1.99	0.68	32.06
Racine, Wis	1.29	0.53	0.35	T.	1.69	0.31	
Fort Sheridan, Ill	1.44	0.91	0.52		2.47	0.27	
Chicago, Ill	2.25	1.11	0.58	1.60	2.11	0.14	34.76
Glenwood, Ill	2.48	1.79	0.80	1.54	1.65	0.20	
Hammond, Ind	1.74	1.38	0.55	0.71	1.09	0.13	
Laporte, Ind	2.65	2.29	2.06	1.52	3.37	0.83	
Berrien Springs, Mich	3.57	3.55	3.20	2.70	6.72	0.96	
South Bend, Ind	3.61	2.25	2.01	2.18	3.81	0.80	
Syracuse, Ind	4.21	2.20	2.67	2.85	4.06	1.62	
Mottville, Mich	3.53	2.09	2.32	2.27	4.64	0.57	
St. Joseph, Mich	2.12	2.75	0.25	2.19	2.26	1.10	
Vandalia, Mich	3.94	2.68	2.67	2.86	4.54	1.10	
Wasepi, Mich	3.37	2.18	2.80	2.33	4.27	0.60	
Coldwater, Mich	4.46	2.00	2.88	1.91	3.73	0.74	
Parkville, Mich	3.61	2.44	2.84	2.54	4.53		
Kalamazoo, Mich	3.45	2.44	1.61	1.80	4.74	2.03	36.20
Battlecreek, Mich	3.16	2.25	2.72	2.16	3.61	1.33	
Hanover, Mich	2.79	1.66	2.12	2.09	2.94	0.84	
Somerset, Mich	3.32	2.47	2.06	2.94	2.70	0.55	
Hastings, Mich	3.30	2.59	2.27	1.74	3.47	1.84	
Jackson, Mich	3.36	1.63	2.11	1.59	3.43	0.69	
Lansing, Mich	2.60	1.27	2.05	1.65	3.17	1.93	31.60
Williamston, Mich	3.92		2.00				
Grand Haven, Mich	2.81	2.15	2.01	1.13	2.19	2.02	34.27
Grand Rapids, Mich	3.26	2.31	2.56	1.76	3.60	0.77	
Muskegon, Mich	2.40	1.14	2.75	1.89	1.75	0.75	
Stanton, Mich	4.28	2.58		0.96	1.33		
White Cloud, Mich	1.24	1.52	1.12	2.12		1.20	
Big Rapids, Mich	3.01	1.20	1.84	2.18	3.84	1.21	
Hart, Mich	2.41	2.45	1.65	1.25	1.25	1.70	
Fairview, Mich	2.31	1.51	1.51	1.28	3.45	0.16	
Ludington, Mich	2.10	1.27	0.92	1.10	2.16	0.65	
Baldwin, Mich	3.02	2.08	1.70	1.49	2.70	0.95	
Reed City, Mich	1.84	1.00	0.69	0.90	2.68	2.10	
Manistee, Mich	2.32	1.26	0.79				33.70
Boon, Mich	3.39	2.58	2.65	1.49	2.72	1.84	
Lake City, Mich		1.65	0.50	1.35	2.50	T.	
Ivan, Mich	1.99	3.62	1.78	0.50	2.43	1.22	
Frankfort, Mich	2.71		0.95	1.81	2.99	T.	
Traverse, Mich	1.29	3.20	1.09	0.39	1.52	1.79	
Old Mission, Mich		2.35	2.04	0.60	2.31	1.83	
Northport, Mich	2.35	3.30	1.60		2.25	1.40	42.13
Mancelona, Mich	2.14	3.50	1.80	0.80	2.80	2.70	
Charlevoix, Mich	2.57	2.90	2.11	1.84	3.00	2.51	
Petoskey, Mich	2.74	2.17	2.15	1.82	2.32	2.19	

Precipitation—Continued.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal annual.
Lake Huron Basin.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Cockburn Island, Ont	3.63	2.07	2.40	0.40	2.50	2.62	
Sudbury, Ont		1.60	1.25		1.80		
North Bay, Ont			1.60	0.60			
Uplands, Ont	2.64	5.13	7.50	1.50	5.60	1.09	
Sprucedale, Ont	2.57	6.06	5.78	1.30	4.61	0.85	
Parry Sound, Ont	3.63	6.09	7.28	2.76	4.54	1.25	37.27
Whiteside, Ont	2.21	8.65	6.31	2.86	4.85	1.68	
Coldwater, Ont	2.26	6.25	3.55	1.70	4.05	1.36	
Orillia, Ont	2.20	3.88	2.79	1.50	4.08		
Collingwood, Ont	4.73				4.60	1.10	
Barrie, Ont	2.81	2.98	2.05	1.19	4.47	2.15	
Durham, Ont	2.85	6.90	4.66	3.20	4.35	1.73	
Owen Sound, Ont	2.76	10.50	8.51	2.63	5.54	2.16	
Saugeen, Ont	2.12	4.82	3.91	2.65	3.52	1.59	34.57
Point Clark, Ont	0.95	2.37	3.57	1.74	2.42	1.62	33.05
Lucknow, Ont	3.81	3.96	4.70	1.76	3.63	1.30	
Sarnia, Ont	1.16	1.77	1.28	2.35	1.50	0.30	
Sault Ste. Marie, Mich	2.02	1.26	1.61	1.10	1.44	1.85	29.53
Mackinaw, Mich	1.48	1.08	1.91	0.85	1.83	2.05	
Cheboygan, Mich	2.80	1.52	1.48	1.39	3.72	2.22	
Rogers, Mich		2.19	0.35	1.30	3.49	0.47	
Alpena, Mich	1.09	1.22	0.88	0.47	2.39	2.01	
Luzerne, Mich	1.87	2.13	0.82	1.76	3.57	1.68	
Grayling, Mich	2.65	2.85	1.15	0.45	4.95	0.50	27.44
West Harrisville, Mich	1.01	1.22	1.11	1.32			
Harrisville, Mich	1.38	1.77	1.40	1.38	4.24	0.87	
Omer, Mich	1.95	1.15	0.80	1.66	3.80	1.20	
Gladwin, Mich	2.20	2.50	1.50	1.90	3.28	1.65	
Mount Pleasant, Mich	2.73	0.67	0.98		3.96	1.05	
Alma, Mich	3.22	2.03	1.35	1.18	3.55	0.81	
Saginaw, Mich	2.82	2.11	1.82	1.38	5.56	0.98	
Bay City, Mich	2.59	1.46	1.93	1.10	3.02	1.21	
Port Austin, Mich		0.25	0.90	0.99	4.08	0.90	
Hayes, Mich	1.09	0.32	0.90	0.70	3.54		
Sand Beach, Mich	3.08	0.67	1.41	0.95	2.47	0.88	
Carsonville, Mich	2.18	1.89	2.26	0.84	4.05	0.44	
Vassar, Mich	1.89	1.23	1.95	1.13	4.80	0.93	
Arbela, Mich	2.09	2.47	1.80	1.90	3.91	0.88	
Flint, Mich	2.19	1.28	1.84	1.31	3.66	1.00	
Owosso, Mich	2.52	1.35		1.60	4.74		
Madison, Mich	3.10	2.20	2.33	1.95	3.57	0.48	
Lapeer, Mich	1.02	0.35		1.70	3.95		
Thornville, Mich	2.88	1.56	3.31	1.71	4.34	0.67	32.66
Howell, Mich	2.14	1.77	2.18	2.38	2.31		
Jeddo, Mich	3.33	2.79	2.74	1.11	3.89	0.68	
Port Huron, Mich	3.19	3.17	2.02	0.95	2.93	0.77	31.60
Lake St. Clair Basin.							
Strafford, Ont	2.92	4.41	3.05	1.78	3.83	1.33	35.85
St. Marys, Ont	2.88	3.03	2.25	1.10	3.10		
London, Ont	3.73	3.65	3.11	2.80	6.01	1.25	38.69
Birnam, Ont	3.36	3.26	2.46	2.13	3.93	0.92	
Chatham, Ont	3.17	3.52	1.97	1.86	5.14	0.35	
Ridgetown, Ont	3.22	2.77	2.76		4.56	0.33	
Cottam, Ont	4.35	2.45	2.14	2.61	5.23	0.51	
Windsor, Ont	3.58	2.65	1.74	2.16	4.18	0.66	
Detroit, Mich	2.92	2.75	1.75	2.12	4.36	0.53	32.33
Plymouth, Mich	3.22	1.38	1.25	1.83	3.59	0.27	
Lake Erie Basin.							
Erasmus, Ont	5.65	4.06	3.12	2.30	4.75	2.18	
St. George, Ont	3.06	2.40	2.89	1.40	2.51	1.63	
Woodstock, Ont	1.95	1.91	0.85	1.31	3.25	0.02	
Port Dover, Ont	3.17	3.19	2.79	1.83	4.31	0.84	34.48
Port Stanley, Ont	3.43	3.47	2.97	1.82	4.90	0.53	34.17
Clinton, Mich	3.45	2.19	1.70	1.64	3.77	0.44	
Hillsdale, Mich	4.03	1.89	2.44	2.02	4.01	0.87	
Adrian, Mich	2.34	1.85	1.91	2.06	3.87	0.59	
Grape, Mich	2.97	3.34	1.98	2.05	3.91	0.40	
Angola, Ind	4.66	2.17	3.00	3.17	4.17	0.65	
Auburn, Ind	3.08	1.77	2.03	2.01	3.02	0.69	
Fort Wayne, Ind	3.56	2.33	2.34	2.35	5.01	0.70	
Sylvania, Ohio	3.63	2.61	2.62		4.01		
Wauseon, Ohio	3.39	3.28	3.90	4.52	5.47	1.19	37.54
Ridgeville Corners, Ohio	2.96	2.14	2.28	2.21	4.41	0.83	
Napoleon, Ohio	2.65	3.06	1.25	2.52	4.39	1.56	
Neapolis, Ohio	2.69	3.19	2.49	2.50	3.67	1.77	
Hedges, Ohio	2.87	2.50	2.88	1.54			
Defiance, Ohio	3.20	2.40	2.08	2.21	3.99	2.49	
Leipsic, Ohio	2.52	2.58	2.57	1.82	4.62	0.56	
Ottawa, Ohio	2.66	2.48	2.84	1.58	4.52	1.45	
Van Wert, Ohio	2.84	2.25	2.25	1.70	4.76	0.44	
Benton Ridge, Ohio	2.83	3.51	3.70	1.31	5.18	1.48	
Findlay, Ohio	3.13	2.51	3.19	1.50	4.57	1.77	
Upper Sandusky, Ohio	3.50	3.14	3.20	2.44	4.48	1.19	
Bucyrus, Ohio		1.25				1.33	
Tiffin, Ohio	2.97	3.30	3.72	2.20	5.06	2.64	
Bowling Green, Ohio	2.70	1.57	2.17	2.39	4.59	1.21	
Toledo, Ohio	2.21	1.99	1.97	1.91	3.93	0.92	30.93
Rocky Ridge, Ohio	3.25	2.73	2.53	1.80	4.50	0.46	
Sandusky, Ohio	2.37	2.35	3.13	1.62	4.38	1.02	34.91
Vermillion, Ohio	2.90	2.53	3.77	1.64	5.86	1.06	
Oberlin, Ohio	2.93	2.89	2.80	1.79	4.67	1.35	
Norwalk, Ohio	2.95	1.65	3.63	1.94	5.42	0.77	
Wellington, Ohio	3.09	2.82	3.24	1.86	4.84	1.44	
Shenandoah, Ohio	3.38	2.59	3.15	1.56	4.02	1.27	
Mansfield, Ohio	6.00	4.30	3.61	2.31	5.55	1.75	
North Royalton, Ohio	3.44	2.63	2.73	1.53	2.65	1.87	
Hudson, Ohio	4.78		2.70		4.05	1.24	
Strongsville, Ohio	3.36	6.04	3.65	1.97	4.50	3.11	
Bement, Ohio	4.05	1.87	1.73	2.44	5.03		
Cleveland, Ohio	2.67	2.13	2.45	1.54	3.64	0.99	36.29
Willoughby, Ohio		3.11	2.78	1.75	4.78	1.30	
Hiram, Ohio	4.66	2.68	3.06	1.77	4.63	1.25	
Colebrook, Ohio	3.69	1.69	2.60	1.34	3.31	0.64	

Precipitation—Continued.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal annual.
Lake Erie Basin—Continued.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Hillhouse, Ohio	4.32	3.72	2.84	2.82	4.22	1.17	....
Perry, Ohio	4.30	2.40	2.82	2.51	3.64	1.20	....
Ashtabula, Ohio	4.15	4.64	3.12	3.30	4.90	....	....
Erie, Pa	3.58	2.84	1.50	1.44	3.08	1.08	41.28
Franklin, Pa	3.89	1.31	....	....	4.19	1.06	....
Westfield, N. Y	2.85	3.29	1.23	1.35	2.98	1.01	....
Arcade, N. Y	3.79	3.15	2.22	1.49	2.41	1.04	....
Buffalo, N. Y	3.98	3.52	2.88	1.62	3.08	1.02	38.04
Niagara Falls, N. Y	3.00	3.03	1.76	1.40	2.27	....	....
Lake Ontario Basin.							
Alton, Ont	2.46	2.80	1.73	1.85	....	....	31.05
Hamilton, Ont	2.58	1.56	2.12	1.19	3.74	1.42	....
Stony Creek, Ont	3.81	3.57	2.97	1.86	6.19	1.24	....
Niagara, Ont	2.79	2.68	1.81	2.35	3.52	1.23	....
Welland, Ont	3.38	4.82	2.83	2.26	4.47	1.39	37.18
Toronto, Ont	3.01	2.55	2.87	1.73	4.28	1.62	30.75
Stouffville, Ont	2.72	3.83	3.78	1.79	5.42	2.98	....
Millbrook, Ont	2.40	2.20	3.50	2.15	3.70	1.50	....
Port Hope, Ont	2.81	2.23	4.50	1.75	4.05	1.51	....
Peterboro, Ont	1.65	2.97	4.50	1.47	5.09	1.24	30.93
Lindsay, Ont	1.96	2.65	3.17	1.62	4.15	1.80	....
Haliburton, Ont	2.34	3.01	3.40	1.15	3.79	1.04	....
Deseronto, Ont	2.90	2.36	3.61	1.23	2.76	1.79	....
Bloomfield, Ont	2.24	1.74	2.45	1.69	2.66	1.51	....
Kingston, Ont	1.26	1.68	2.15	1.22	3.43	1.07	33.94
Ottawa, Ont	1.43	3.13	2.16	0.89	5.68	1.03	33.63
Montreal, Ont	2.15	3.20	4.62	1.63	8.53	1.62	38.81
Ridgeway, N. Y	3.20	2.34	1.52	1.98	2.50	1.25	....
Rochester, N. Y	3.54	3.01	2.54	2.38	3.47	1.66	34.82
Avon, N. Y	2.72	1.33	0.81	0.80	1.33	1.39	....
Mount Morris, N. Y	1.74	1.60	1.20	0.65	1.40	....	....
Nunda, N. Y	3.63	2.33	1.61	1.98	2.86	2.35	....
Wedgwood, N. Y	2.73	1.98	1.72	2.07	2.80	1.03	....
Ithaca, N. Y	3.15	2.22	1.67	1.48	2.46	1.45	32.72
Penn Yan, N. Y	2.63	2.15	1.70	1.29	2.33	1.27	28.70
Romulus, N. Y	4.48	2.01	1.24	1.00	2.35	0.59	....
Fleming, N. Y	2.21	1.80	0.40	....	....	1.04	....
Sherwood, N. Y	3.48	1.87	1.04	1.21	2.14	....	....
Auburn, N. Y	3.65	2.50	1.30	1.61	3.20	1.70	....
Lyons, N. Y	3.00	1.94	0.92	1.26	3.24	1.46	....
Baldwinsville, N. Y	3.31	3.13	1.33	1.67	4.40	1.90	....
Skaneateles, N. Y	3.95	3.12	1.20	1.36	3.65	1.82	....
Fayetteville, N. Y	3.25	2.15	0.98	1.62	3.62	....	....
Phenix, N. Y	3.80	3.20	1.52	3.41	5.08	2.09	....
Fulton, N. Y	3.06	1.33	1.28	1.80	3.64	1.79	....
Oswego, N. Y	3.33	3.25	2.73	2.74	4.56	1.69	35.02
Palermo, N. Y	3.25	2.25	1.58	1.44	2.38	1.32	....
Adams, N. Y	3.14	4.04	3.58	1.95	4.61	1.26	....
Lowville, N. Y	3.41	4.54	3.64	2.30	5.11	2.01	....
Madison Barracks, N. Y	....	2.40	1.60	0.70	2.70	....	....
Watertown, N. Y	3.02	5.65	3.36	2.31	5.21	2.76	....
Number Four, N. Y	3.49	7.44	4.58	2.70	5.45	2.15	....

OBSERVATIONS AT RIVAS, NICARAGUA.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26′ N., 85° 47′ W. The observations at 7:17 a. m., local time, are simultaneous with Greenwich 1 p. m. The altitude of his barometer is 36 meters above sea level, but until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0–12. When cloudiness is less than $\frac{1}{10}$, the letter "F," or "Few," is recorded. This station is situated on the western shore of Lake Nicaragua, not far from the eastern end of the western division of the Nicaragua Canal. The volcano Ometepe, on an island in Lake Nicaragua, is about 10 miles northeast of the station. Mr. Flint's records occasionally mention the presence of clouds on the summit of this mountain.

Observations at Rivas, Nicaragua, March, 1899.

OBSERVATIONS AT 7:17 A. M. LOCAL (8 A. M. EASTERN STANDARD) TIME.

Date.	Temperature.		Wind.		Upper clouds.			Lower clouds.			Daily rainfall.
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
	°	°									
1	76	73	ne.	1	....	....	....	k.	9	ne.	T.
2	74	67	ne.	1	....	....	....	k.*	Few	ne.	0.00
3	76	71	ne.	2	....	....	....	k.	10	ne.	0.00

Observations at Rivas, Nicaragua, March, 1899—Continued.

OBSERVATIONS AT 7:17 A. M. LOCAL (8 A. M. EASTERN STANDARD) TIME.

Date.	Temperature.		Wind.		Upper clouds.			Lower Clouds.			Daily rainfall.
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
	°	°									
4	75	69	e.	1	....	....	....	k.	1	e.	T.
5	75	71	e.	2	....	....	....	k.	Few	e.	0.00
6	76	71	ne.	2	....	....	....	ak.	9	ne.	T.
7	75	70	ne.	3-4	....	....	....	k.	Few	ne.	0.05
8	74	68	ne.	8-9	....	....	....	f.k.	2	ne.	T.
9	74.5	68	ne.	3-5	....	....	....	f.k.	3	ne.	0.00
10	74.5	67	ne.	4	as.	1	sw.	k.	9	ne.	0.00
11	75.5	68	ne.	4	....	....	....	k.*	Few	ne.	0.00
12	76	70	ne.	3	....	....	....	ks.	10	ne.	0.00
13	78	72	ne.	3	....	....	....	k.	4	ne.	0.00
14	77	72	ne.	3	....	....	....	k.	1	ne.	0.00
15	77	73	ne.	2	....	....	....	k.	5	ne.	0.00
16	78	72	ne.	4	....	....	....	k.	Few	ne.	0.00
17	77	72	ne.	2	....	....	....	k.	Few	ne.	0.00
18	76	70	ne.	3	....	....	....	f.k.	5	ne.	0.00
19	74	71	sw.	0	....	....	....	ak.	3	sw.	0.00
20	77	73	ne.	0	ck.	10	sw.	....	....	....	0.00
21	77	70	ne.	1	cs.	1	se.	k.	4	ne.	0.00
22	78	72	ne.	5	cs.	1	....	k.	2	sw.	0.00
23	76.5	70	ne.	1	....	....	....	k.*	Few	ne.	0.00
24	77	71	ne.	1	....	....	....	k.	3	ne.	0.06
25	77.5	71	ne.	1	cs.	9	sw.	k.	1	ne.	0.00
26	77	70	e.	3	cs.	1	sw.	k.	9	e.	0.00
27	77.5	72	ne.	2	....	....	....	k.	10	ne.	0.00
28	78.5	71	e.	2	....	....	....	k.	1	e.	0.00
29	77.5	72	ne.	2	....	....	....	k.	10	ne.	0.00
30	79	73	e.	2	....	....	....	k.	7	e.	0.09
31	79.5	72	ne.	3	....	....	....	ak.	10	ne.	0.51
Sums	....	....	....	....	....	....	....	....	....	....	0.65
Means	76.4	....	....	....	....	....	....	....	....	....	....

*On Ometepe.

OBSERVATIONS AT 8 P. M. SEVENTY-FIFTH (8:17 P. M. LOCAL) TIME.

Date.	Temperature.		Wind.		Upper clouds.			Lower clouds.		
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.
	°	°								
1	78	72	se.	1	....	0	....	....	0	....
2	78	71	ne.	2	....	0	....	k.	Few	....
3	77	72	se.	2	....	0	....	....	0	....
4	79.5	72	se.	0	....	0	....	....	0	....
5	79	72	se.	2	....	....	....	k.	Few	se.
6	77	70	se.	3	....	....	....	kn.	10	se.
7	76	70	e.	3	....	....	....	kn.	5	e.
8	75.5	68	ne.	5-6	ck.	Few	ne.	k.	Few	ne.
9	78	71	ne.	3-4	ck.	Few	sw.	k.	Few	ne.
10	77.5	70	ne.	3	ck.	Few	sw.	....	0	....
11	78.5	71	ne.	3	ck.	Few	sw.	....	0	....
12	78	71	ne.	3	c.	....	s.	....	0	....
13	78	72	e.	2	....	0	....	k.*	Few	....
14	80	72	ne.	3-4	....	....	....	f.k.	Few	....
15	81	74	ne.	3	....	....	....	f.k.	8	ne.
16	80.5	73	ne.	4	....	0	....	....	0	....
17	79.5	72	e.	2	....	....	....	f.k.	10	....
18	80	73	e.	3	....	0	....	f.k,	Few	e.
19	77	73	sw.	1	ck.	10	sw.	....	....	....
20	80.5	73	ne.	3	ck.	....	se.	f.k.	3	ne.
21	80.5	72	ne.	2	ck.	....	sw.	k.	8	ne.
22	80	73	ne.	2	ck.	....	sw.	f.k.	4	ne.
23	80	72	ne.	4	....	0	....	k.*	0	....
24	80.5	72	ne.	3	ck.	....	sw.	cap*	0	....
25	81	73	se.	2	ck.	....	....	f.k.	2	se.
26	80	73	e.	3	cs.,ck.	3	e.	....	....	....
27	81.5	73	ne.	4	....	....	....	ak.	2	ne.
28	80	74	ne.	4	ck.,cs.	10	ne.	....	....	....
29	82	75	se.	2	ck.	2	se.	....	....	....
30	81	76	se.	1	....	....	....	k.	5	se.
31	77.5	73	e.	2	....	....	....	k.	10	e.
Means	79.1	....	....	....	....	....	....	....	....	....

*On Ometepe.

6th, 8 p. m., wind increasing; 7th, gale after 9 p. m.; 8th, barometer at 29.86, gale continues; sprinkling 3 p. m.; 8th, p. m. coffee injured; 9th, 2 a. m., gale moderating; 12th, earthquake 4:18:47 a. m., northwest to southeast, occurred at Leon, Managua, Granda, and San Juan del Sur.

TEXT BOOKS ON BOTANY.

By Frederick V. Coville, Chief of Division of Botany, U. S. Department of Agriculture.

In response to a request by the Chief of the Weather Bureau, Mr. F. V. Coville, Chief of the Division of Botany, communicates the following suggestions:

With reference to books on botany, suitable for Weather Bureau observers, I would suggest that their interest in botany is likely to follow one of two lines: 1st. Physiological botany with special reference to agricultural crops and soils. 2d. Systematic botany with special reference to their local flora.

Among the various books on physiological botany I would recommend as best for this purpose one entitled A Text-book of Botany, translated from the German of Strasburger, Knoll, Schneck, and Schimper, which is published by MacMillan & Co., New York, at $4.50. Another book, which though not primarily a publication on physiological botany, but nevertheless one of the highest utility in this line, is the three-volume, seventh edition of Storer's Agriculture in some of its Relations with Chemistry, published in New York, at about $5. This is a book of the same character as Johnson's How Crops Feed, but covers the ground much more comprehensively, and brings the information authoritatively up to date. In the matter of systematic botany I would recommend, as a preliminary text book for the learning of terminology and morphology, Gray's Lessons in Botany, published in New York, at $1.10, and L. H. Bailey's Lessons with Plants, published by MacMillan & Co., at $1.10. After going through either or both of these, the student will be in a position to use the various local floras as follows:

Northeastern United States: Gray's Manual of Botany, or Britton & Brown's Illustrated Flora, the latter published by Charles Scribner's Sons, in three volumes, at $3 per volume.

Southern States: Chapman's Flora of the Southern States, published by the Cambridge Botanical Supply Company, Cambridge, Mass., at $4. (Third edition.)

For the Rocky Mountains: Coulter's Manual of Rocky Mountain Botany, which may be secured at a cost of $1.85.

For Texas: Coulter's Botany of Western Texas, published by the Division of Botany, U. S. Department of Agriculture, at 35 cents.

For California: Greene's Manual of Bay Region Botany, published by the author, at $2. Brewer and Watson's Botany of California, issued in two volumes, published at Cambridge, Mass., at about $10.

For the Pacific Northwest: Flora of Northwest America, of which about one-third has been published, and can be secured of Mr. M. W. Gorman, No. 75 Fourteenth street, North Portland, Oregon, at about 50 cents.

NOTES BY THE EDITOR.

PAMPEROS AND CYCLONIC STORMS.

The Pilot Chart of the North Pacific Ocean for June, 1899, contains a short article on a cyclonic storm at the mouth of the Rio de la Plata, October 20, 1897. By collecting the reports from several vessels and land stations, the author of this article has been able to draw a system of approximate isobars and winds for 10 a. m., October 20. This again illustrates the good work referred to in the Monthly Weather Review for March, page 114, that can be done by the utilization of the great mass of material that is steadily accumulating in the archives of national hydrographic and admiralty offices. Many years ago large collections of manuscript log books were destroyed for lack of storage room. They represented the best work of navigators in sailing vessels on all parts of the ocean. Now that the tracks of steamers are so direct, it is questionable whether we shall ever again be able to accumulate ocean data in sufficient quantity to trace storm paths in the unfrequented portions of the ocean. And yet meteorology can not be properly studied without a daily weather map of the ocean as well as of the land. We must, therefore, hope that, both by individual and by combined efforts, the navigators and hydrographers will come to the assistance of the meteorologists and devise some method for the publication of the best daily weather chart that it is possible to compile in the present state of navigation. The Editor kept up such a daily chart to the end of 1895, for the most frequented portions of the north Atlantic Ocean; and it seems certain that a great chart of the Atlantic, like that for the year 1882, published by the London Meteorological Office, if continued for only ten or fifteen years, and even if published in only very limited numbers, would be a boon to the student of meteorology.

The Pilot Chart says:

The 20th of October, 1897, was marked by the occurrence, in the vicinity of the mouth of the Rio de la Plata, of a severe storm of the pampero type. This storm was due to the passage over Montevideo of a well-developed area of low pressure, which had its origin in the interior of the continent to the westward. At Rosario the pressure began to diminish at noon of October 17, reached its lowest point at 6 a. m., October 19, and had recovered somewhat at 10 a. m., October 20, when the pressure had risen to 29.54 inches, and the chart represents the condition of affairs at this time. Owing to the lack of observers, it is impossible to trace the progress of the storm center eastward after leaving the coast, but its effects were felt two days later by three vessels, which were at that time 25° in longitude east of Montevideo.

Two well-marked types of the pampero may be distinguished, both associated with areas of low barometric pressure: 1. The summer pampero, locally known as "turbanado," which may be described as a brief but violent thunderstorm, sometimes, indeed, of extraordinary violence. 2. The winter pampero or true wind from the pampas, the cold southwesterly gale which blows in the rear of the eastward-moving barometric depressions, varying in duration from a few hours to several days, and showing a close analogy to the "norther" of the Gulf of Mexico. The former type prevails during the period October to March, the latter from April to September, although the seasonal differences throughout these regions are not sufficiently pronounced to give a decided preponderance to either variety. During the spring months, October and November, this being the season of maximum frequency of pamperos, the number of each occurring is about the same.

The mariner sailing these waters should always be on his guard against the occurrence of these storms, for although their violence has been to some extent exaggerated, the winds rarely attaining full hurricane force, yet the frequent extreme abruptness of the shift from north to southwest, and rapid increase of wind, often renders measures of safety impossible, if delayed too long. The signs of the approach of the pampero are almost unmistakable. The storm is primarily due to the approach and passage of an area of low barometer, around which the winds circulate in a right-handed direction, or against the sun, at the same time drawing inward toward the center. The front or eastern half of the storm is therefore marked by falling barometer, rising temperature, warm northerly or northeasterly winds, and sky becoming gradually overcast with passing showers of fine rain. These conditions may prevail from one to three days. As the center or trough of the storm approaches, heavy cumulo-nimbus clouds gather in the southwest, quickly approaching and darkening the whole atmosphere. Flashes of lightning of startling brilliancy are also a frequent, although not an invariable feature of this period of the storm. The northerly winds continue to flow until the falling barometer becomes almost stationary, when a brief period of calm ensues, often accompanied, as in the present case, by a temporary partial clearing of the sky. The lull, however, is of short duration. Suddenly the pampero breaks with a squall of almost hurricane force from southwest, the barometer starts to rise, the rain ceases in a series of heavy showers, and the gale blows itself out from this quarter as the depression moves off to the eastward.

SPOOL KITES AND KITES WITH RADIAL WINGS.

At the recent meeting in Washington of the National Academy of Sciences Prof. Alexander Graham Bell described a number of experiments recently made by him with both the Hargrave and other forms of kites. The Hargrave kite of the style called by him the great Hargrave kite, was completed September 1, 1898, at his laboratory at Beim Breagh, N. S. It is about 11 feet long, 8 feet broad, and 4 feet deep, and consists of two of the regular Hargrave cells, 4 by 4 by 8, separated by a space of 3 feet. The "manhole" kite was

completed at the same laboratory September 6, and differs from the preceding principally in the proportions and the system of internal bracing. It is about 2 feet deep, 8 feet broad, and 8 feet long. The great manhole kite, or the Jumbo, was completed October 18, 1898, at the Beim Breagh laboratory. It is about 16½ feet long, 5½ deep, and 11 broad. The front and rear cells are rectangles 5½ by 5½ by 11 feet, and they are separated by a blank space of the same dimensions.

Before experimenting with these Professor Bell and his assistants had devised a large number of peculiar forms, which, although they may not be of much value to the meteorologist as a means of raising meteorographs to explore the upper air, yet are of great interest to the student of hydrodynamics as offering many interesting problems for his study. Some of these new forms Professor Bell denominates kites with radial wings. Others have, instead of wings or cells, various conical appendages or members, but all have the common characteristic that two similar members are separated by a rod whose axis coincides with the axis of the front and rear member, so that in general they may all be denominated spool kites; these fly by a cord attached at some point in the axis of the spool between the kite frames. All these forms were devised and used before June 24, 1898, and most of them are shown in the sketches given on Chart No. XI, where they are numbered as follows:

No. 1. The two radial winged kite.
No. 2. The three radial winged kite.
No. 3. The giant three radial winged kite.
No. 4. The four radial winged kite.
No. 5. The five radial winged kite.
No. 6. The two winged kite with conical tail.
No. 7. The two winged kite with revolving fan tail.
No. 8. Conical spool kite.
No. 9. Conical spool kite.
No. 10. Conical spool kite.
No. 11. Conical spool kite.
No. 12. Conical spool kite.
No. 13. Conical spool kite.
No. 14. Conical spool kite.
No. 15. Semiconical spool kite.
No. 16. Semiconical spool kite.
No. 17. Double cone kite.

Of all these forms Professor Bell found the kites with three radial wings, Nos. 2 and 3, most interesting. The reader will notice that in all these kites the axis of the spool has an extra length, so that the two members may be set at different distances apart. The string by which the kite is flown is also adjustable at different points, so as to determine the best angle of flight. Photographs were taken of the four-winged and the five-winged kites when flying in the air, the string being attached to the top of a tall flagstaff; the appearance of the kites shows that the angles of inclination were not favorable to the attainment of great heights.

Perhaps the most remarkable kites were made by giving a twist to each of the three or four individual radial arms at each end of a spool, and allowing each set to revolve freely about the axis of the spool independently of the other set. This freedom to revolve seemed to make no difference in the flying, but decidedly increased the steadiness of the kite. The pull on the string was not sensibly diminished when the wings revolved, as compared with that when they were stationary. The angle of elevation of the kite string was not stated by Professor Bell.

Will it not be possible to add to the ordinary Hargrave kite a small fan driven by the wind to furnish motor power for use in connection with the self-registering meteorological apparatus? It would seem that the whirling fan does not add sensibly to the pull on the wire at the reel. In fact, it is well known that this pull depends on the action of the wind on the long line of wire, even more than on the wind action at the kite itself.

NEWSPAPER FAKES.

It is frequently the duty of the Editor to enter into correspondence with those who contribute to the daily press circumstantial accounts of remarkable phenomena, such as ball lightning, falling meteors, tidal waves, earthquakes, hailstorms, showers of fishes, frogs, pollen, and numerous other quasi meteorological phenomena.

It would surprise the uninitiated to discover how many of these newspaper items are misleading exaggerations, and an intelligent man can but wonder how it is that so many sensational accounts of ordinary meteorological phenomena come to be published. Apparently the fault is not always with the editors of the newspapers, but lies with the news agents who have authority to write or telegraph to headquarters whatever they think will interest the readers of the paper or benefit the town that they represent. Thus, on May 2, a press dispatch from Vincennes, Ind., flooded the whole country with the announcement that—

> Councilman ——— and Contractor ——— picked up the pieces of a snow-white flinty meteor whose external surface was of orange or yellow color. The meteors, for there were two of them, had struck some large stones in their fall and broken to pieces.

At the request of the Editor the voluntary observer of the United States Weather Bureau at Vincennes kindly obtained a piece of the stone and some further description of the event. The stone proves to be merely a fragment of a quartz boulder that had been discolored on the outside by red clay soil. If it fell as described, it must have been thrown from a distance by blasting or some other method. A fairly intelligent news gatherer or press agent might easily have seen that it had none of the characteristics of a meteoric stone and might have saved the people the bother and expense of telegraphing, printing, and reading his interesting little item. Our public schools generally teach enough science to enable a news gatherer to avoid being duped. There is no excuse for one who wilfully or ignorantly misleads his readers. If one pepetrates a fake or hoax in these small matters how shall we know when to trust him in the more important items of political and financial history?

While the Editor of the Monthly Weather Review desires to secure interesting items, yet he does not wish anything fictitious or misleading. The voluntary and regular observers will confer a favor if, in sending him important newspaper items, they also add such criticisms of their own as will show the amount of credence to be given to the articles.

UNIVERSITIES AND METEOROLOGY.

The hearty interest in the progress of science that is felt in every branch of the Department of Agriculture is well set forth in an article by the Chief of the Weather Bureau, published in the Ohio State Journal for May 7. Among other things, Professor Moore said:

> Meteorology is so interwoven with other natural sciences that we must look to the technically trained men of the future to explain many things of which we are now ignorant. This science presents to the student unlimited opportunities for theoretical investigations. At the same time it contains problems that engage the serious attention of practical men. A thoroughly equipped investigator should be, at least, a physicist, an astronomer, and a mathematician. As a rule, only graduates of universities and scientific schools have this educational foundation. This establishes a close relationship between educational institutions and the scientific departments of the Government. One is the training ground, the other an enlarged field of operations. * * *

Many of the Weather Bureau stations are located in cities in which there are one or more colleges. The Secretary has directed that at such stations, student observers be employed whenever by so doing, it is possible to economically perform the service of the Weather Bureau and at the same time permit poor, but ambitious boys to get a scientific education. * * * To-day there are about twenty-five young men in different subordinate capacities in the weather service who are thus working out their scholarships. * * * It is the lifting up from the lower to the higher strata of society, rather than the cultivation of a few favored ones at the top, that inures to the homogeneity and welfare of the people.

NOT BALL LIGHTNING.

The April number of the Climate and Crop Report for Virginia publishes an interesting case of lightning, described by Mr. G. E. Murrell at Colemans Falls, now Fontella, Bedford Co., Va.

Although this lightning is described as a globe, six or eight inches in diameter, traveling from northeast to southwest horizontally, at about 100 feet above the earth, and diminishing in size as it passed through three locust trees successively, yet the Editor notes that the characteristic feature of ball lightning, viz, its very slow motion and its eventual explosion at the end of its journey, without doing much damage, were all absent, and we must hesitate to consider this as a well authenticated case of genuine ball lightning.

EMPIRICAL GENERALIZATIONS FOR SOUTH CAROLINA.

Attention has been called to the fact that—

In South Carolina on April 5 snow and ice occurred in that State, the snow being confined to the northern border counties. It is a coincidence worthy of notice that in the cold year of 1835 snow fell in April also. It undoubtedly takes more than two so widely separated years to establish a rule, but nevertheless the fact is worth remembering while sowing seeds of plants that are susceptible to cold, that when extremely low temperatures occur in February there are likely to be unusually cool periods in the two following months.

We have here what seems to be an excellent illustration of the ease with which empirical rules are framed without a very substantial basis. As we understand the above quotation, it says that occasionally snow and ice have occurred in April, and that, therefore, we may conclude that when extremely low temperatures occur in February there are likely to be unusually cold periods in March and April.

Of course this conclusion does not follow from the premises, and it would be interesting to know just what basis there is for it. Can not the author give us the details of an examination of many years instead of two?

RADIANT HEAT FOR THE PREVENTION OF FROST.

The April report of the California Section quotes an article by E. W. Holmes, of Riverside, Cal., who says that two or three years since the Messrs. Wright Bros., of Riverside, established a 35-horsepower boiler and a large quantity of pipe in order to supply steam to 3 acres of orchard. The steam was made to escape horizontally near the ground, and for each outlet there was a cloud of steam 10 feet long and 3 feet wide; one hundred such vents did the best work for these particular dimensions of boiler and orchard. The steam was turned on with a pressure of 40 pounds, but that would soon drop to 20 pounds. The temperature of the air was raised 3° F. whenever the steam was turned on. It was the heat produced and not the moisture thrown off that was efficacious. The coal consumed by such a system is no more than that used when burned in wire baskets for the purpose of raising the temperature of the air by the direct action of its radiant heat. The production of moisture as a means of preventing frost effects has been a failure here in Riverside, though unquestionably the condensation of steam helps to overcome the cold. The blanket of cold air has no great depth in the valley, and by the use of many small fires it is possible to warm this cold stratum until all shall be of about the same temperature as at the tops of the trees.

Although there are times when the methods of smudging and of running water are useful, yet when we want to produce heat the simplest and least expensive process is the wire basket of burning coals. We have tried the method of crude oil and tar burning in sheetiron kettles; this method furnishes satisfactory heat cheaply, but the clouds of lampblack are so injurious that it is generally discarded. We have tried the raising of the dew-point sufficiently to prevent frost by the evaporation of water into immense quantities of steam; we have tried shallow vats for boiling water, but this method was also insufficient.

When 20 to 40 baskets of soft coal per acre were burned, the temperature was raised from 3° to 5°, or possibly more, and this change of temperature was sufficient. In one orchard a lathe screen was built but the cost was nearly $400 per acre. The method of piping steam through the orchard has been explained above. The most popular system is the burning of coal in a basket, which costs about $4 per acre for the baskets, and $2.50 per night for the coal. The replenishing of the baskets for the second night and the lighting of them is the principal item of labor.

THE PRESENT STATE OF LONG RANGE FORECASTING.

In the Nineteenth Century for March, 1899, pages 418–423, Kropotkin reviews the present state of daily weather forecasting and the possibility of responding to the general desire for predictions of the coming weather several days, if not weeks and months, in advance. He briefly considers the two methods most commonly studied, with a view to laying the basis for such long range predictions, viz: (1), the determination of cycles or periods of recurrence of hot and cool, dry and wet weather; (2), the study of the different types or spells of weather, their duration, and the order of succession in which they follow each other.

Kropotkin enumerates as established, or at least plausible, the so-called 11-year, or more properly, sunspot periodicity in temperature, rainfall, storms, etc; the 35-year period of Brückner; the lunar latitude periods of A. Poincaré and other French students; the 19-year, or nutation period of H. C. Russell; the 7-year period of Murphy; the 26.68-day period of Professor Bigelow; the 5.5-day period of Mr. Clayton; the cold waves of May; the nine alternations of heat and cold annually, as indicated by Mr. Buchan, and the three short periods indicated by Mr. Lamprecht. He concludes that the knowledge of these many waves will certainly be very helpful for long period weather forecasts.

Again, with regard to types of weather, Kropotkin enumerates the system of long period forecasts evolved in India by Blanford and Eliot, in which the probable strength and character of the monsoon rains of summer and the dry monsoon of winter is foreseen several months in advance; also the system evolved in Oregon by Mr. B. S. Pague, forecast official of the Weather Bureau, in which the coming summer weather is predicted in the spring and the winter weather predicted in the autumn; also the results of the studies of Abercromby and van Bebber, who discriminate five distinct types and five subtypes of weather which have a tendency to prevail at certain seasons, to be maintained for several days in succession, and each to be followed by some other specific type.

He states that "some modest attempts at forecasting

weather a few days ahead are already made, and we find them in the shape of hints at the end of the daily meteorological summaries of weather." In this paragraph we assume that Prince Kropotkin refers to the work done by European weather bureaus, he probably has overlooked the fact that in the United States predictions have been made by the method of types, as well as by the study of sequences and by the deductive meteorological theories, with systematic regularity for one day, and, whenever possible, for several days in advance, ever since 1869. During the current month of April, 1899, in fact, Prof. E. B. Garriott has made such predictions for forty-eight hours in advance without exception, daily, for all the States east of the Rocky Mountains, whereas in previous years it has generally been considered allowable to omit the 48-hour predictions and confine one's self to the 24-hour prediction whenever the former seemed rather uncertain of fulfilment. In conclusion, Kropotkin states that a knowledge of the general circulation of the atmosphere, at a given moment, is the one thing needed as a foundation for better predictions and that to achieve this the meteorological stations on mountain tops, the cloud observations, the balloon ascensions, and the American kite methods, must be utilized and he promises a future article analyzing the results of this class of work.

The great interest in the subject of long range predictions of the weather and of the season is shown by the numerous quotations from Kropotkin's article that are going the rounds of the daily press and the monthly reports of the climate and crop sections. Each commentator favors some special view of the subject. Our summary of Kropotkin's article given in the preceding paragraphs shows that he does not commit himself to any theory, nor critically examine the reliability or value of any periods that have been announced from time to time. He merely states that we have the two methods of approaching the subject by cycles and by types, and that hereafter he will publish something relative to the bearing of observations at high level on this problem.

Several commentators have quoted Kropotkin as especially indorsing the so-called sun spot cycle in the following paragraph:

> It is now certain that the number and the size of the dark spots which we see on the surface of the sun are in some way connected with the weather that we have on the earth.

This statement by Kropotkin seems to the present writer altogether too positive, although it is intended to be quite guarded. It is quite plausible that the variations in the sun spots have some general relation to the temperature and radiation of heat from the sun's surface, although the observations of solar radiation have not yet demonstrated this. It is quite plausible that if the solar radiation varies, then we should experience a corresponding variation in the temperature of the earth's surface and the air. It is true that observations of deep soil temperatures have shown some relation of this kind. It is true that Kœppen made it appear plausible that an increase of temperature in the equatorial regions follows the formation of many spots on the sun and that a diminution of temperature in the north temperate zone also followed the same event, whereas the general effect upon the whole earth is masked by the influence of currents of air and the formation of clouds. In November, 1870, the present writer published a short article in Silliman's American Journal of Science in which it seemed to be clearly shown that an increase in the number of spots gave a decrease in the amount of heat received on the summit of the Hohenpeissenberg from the sun. But these and similar computations deal only with annual means of sun spots and atmospheric temperatures. They are equivalent to the assertion that if the mean amount of spotted area on the sun's surface slowly increases from zero up to its maximum value, there is a corresponding slow diminution of about 1° Reaumur, or in an extreme case, possibly 3° Fahrenheit, in the temperatures observed at the ground. Such a statement is equivalent to a long range forecast as to the general average temperature of a whole year, but it tells us nothing with regard to special seasons or daily local weather or the weather of the whole globe for a given day. It gives us no long range rules for weather, but only for the most general climatic conditions as to temperature. It gives us no power of forecasting until we can forecast the spottiness of the sun. Similar computations have been made with reference to rainfall, hail, auroras, cloudiness, thunderstorms, cyclonic storms, the direction of the winds, and other phenomena, but all variations in these latter are results of complex physical processes following the changes in solar radiation. So long as the atmospheric processes are little understood, or not at all, it must be hopeless to handle such forecasts. There is at present no immediate prospect that we shall be able to make long range forecasts based on the condition of the sun's spots.

The study of the subject may be worthy the best efforts of those physicists who, like Professor Langley, are in a position to investigate in detail, the action of the solar radiation upon the earth and its atmosphere. But for the present, the ordinary observers and readers, the progressive inventors, and the enterprising financiers, must not allow their hopes to be raised too high by the ready pens of those who substitute brilliant inventive genius for the solid knowledge that can only come by slow and thorough investigation.

CHARACTERISTICS OF TORNADOES.

Although the Weather Bureau utilizes every opportunity of obtaining reliable descriptions of tornadoes and hopes to even get reliable photographs, yet our progress in that direction is very slow. It is very rare that a cool-headed observer, with sketch book and pencil, notes the phenomena as they are actually present before him. Too much is left to memory and verbal description. The tornadoes of April 27, of which at least four occurred in Missouri, have added to our stock of illustrations a few points that are not always clearly brought out. All of these moved from the southwest to the northeast. With regard to the one at Avalon, Prof. A. W. Baker states that—

> It passed about ½ mile east of him. It was perfect in form, with a complete funnel extending to the earth. The whirl was from left to right and the path from 100 to 200 yards wide. The path of destruction was about 8 miles long. Light rain and small hail fell just before its passage, and it was followed by heavy rains. There was very little lightning or thunder. The tornado seemed to form at the lower corner of the cloud in the southwest.

The Kirksville tornado had a path of 1,300 feet in extreme width; the path of total destruction was from 600 to 1,000 feet wide; "the whirling motion was from right to left, or counter clockwise." This is rather obscure; from left to right would be counter clockwise. As one stands facing the north the sun passes from the east or right hand behind one's back to the west or left hand. This is clockwise. The earth rotates in the opposite direction, or counter clockwise. If an ordinary watch were laid upon the ground at the North Pole, its hands would rotate in a direction opposite to that of the earth, and this would be clockwise. An ordinary low pressure storm has its winds revolving counter clockwise, and this rule is also almost invariable with respect to tornadoes. Mr. E. L. Dinniston, of Kirksville, who was directly in its path, says:

> A short time before 6 p. m. a funnel-shaped cloud was seen to form high in the air about 12 miles southwest of Kirksville. For a short time it hung almost motionless and then the short funnel seemed to

disappear. Again a short funnel was projected downward and began to move slowly at first, in a northeasterly direction, and an ominous roar could be heard for miles. The funnel gradually lengthened, and when about 4 miles from Kirksville the point seemed to be within 200 feet of the ground. Suddenly it dropped like a plummet and started its work of destruction. Just before it struck our house there was an awful roaring noise, and it was dark as a dungeon while the storm was passing over.

Others state that two clouds came together in the southwest; that on either side of the funnel there was an arc glowing like a halo around the moon; above the arcs there was intense blackness and below them lighter clouds; the funnel extending downward between these arcs alternately approached and receded from the earth, and when it approached the earth a dark mass rose to meet it. The arcs disappeared as the tornado drew near; the funnel-shaped cloud seemed to a distant observer to take a zigzag course, sweeping a path much wider than its own diameter. One house was carried high in the air, where it exploded with a loud report. There was a light fall of rain before the storm and a heavy fall a short time after its passage. Very little lightning was seen.

As in many other descriptions, so here, the light rains, the descending spouts, the dark clouds, the ascending whirl of débris, the heavier rain that occurs sometime later, all harmonize so closely with the phenomena of the waterspout at sea that there must be a very close analogy between these and the tornadoes in the interior of our continent.

MARIANO BÁRCENA.

All who are interested in the progress of meteorology will regret to learn of the death of Don Mariano Bárcena, the illustrious engineer, senator of the Mexican Republic, founder and director of the Central Meteorological Observatory, and member of many scientific societies. In his death, on the 10th of April, in the City of Mexico, meteorology loses one of its most active friends. As a student of engineering, he early showed a special interest in the natural sciences, particularly geology, on which subject he is a well-known author. He was appointed a director of the Central Meteorological Observatory on the 7th of March, 1877, the date of the foundation of the establishment. During his connection with this institution, he published many important works, among which may be especially mentioned his Carpologia.

NO INCREASE IN TORNADOES.

Although the Weather Bureau has for many years repeated the statement that our data do not justify us in believing that there has been any material change in the number of tornadoes, nor, indeed, in any other feature of the climate, during the present geological epoch, yet the belief in such changes still lingers, and we are much pleased whenever the daily press comes to the relief of the meteorologist in the attempt to disseminate more correct views as to the permanency of our climate.

We copy the following from the Iowa State Register and the Iowa Weather and Crop Service, as it undoubtedly gives the true explanation of a popular mistake:

Many think that the railroad tracks banding the nation, and the continually increasing and large aggregate of metal on the surface throughout the country, aid in creating electrical disturbances in the atmosphere, and they call attention to the manner in which the needle is affected by the pole to sustain their theory; but the contrary opinion is presented by others, who assert that the railroad tracks and telegraph lines are useful as lightning rods for the earth. The scientists have many theories in regard to this subject, but the fact remains that all countries had windstorms of all degrees before there was a railroad track or telegraph line on the face of the earth, and it is probable that the number has not been increased by the added years. All of the civilized world's disasters are now published within twenty-four hours after occurrence, and that is the reason why there is an apparent large proportional increase in comparison with the days when telegraph and cable lines and daily newspapers were unknown—only one hundred years ago.

NO CHANGE IN THE CLIMATE OF APRIL.

The remarkable storms that we experienced during the spring of 1899, promptly started the query as to whether the climate has changed—that perennial theme about which the "oldest inhabitant" always freely expresses his ideas, though he knows little or nothing of it. It was soon shown that 2, 3, or 4 feet of snow had occurred in the Middle Atlantic States in a single storm several times during the past two hundred years; but, of course, each time over only a small district somewhere between Cape Hatteras and Cape Cod.

Now comes an interesting item with reference to Missouri, contributed by Prof. C. W. Prichett, of Glasgow, Mo., who says:

On April 7, 1837, it snowed all day in St. Charles and Warren counties, and on the morning of April 8 the snow was 2½ feet deep on the level. In April, 1857, the snow lay on the ground near Fayette from the 17th to the 20th to the depth of several inches. On April 15, 1842, the ground was so frozen in Warren County that we could not set stakes in the woods as guides for a worm fence.

RAINS OF SAND, DUST, AND MUD.

In the Review for January, 1895, is given a full description of the general character of the dust that falls on our western plains, with snow or rain, and sometimes as perfectly dry dust; a recent occurrence of this kind is chronicled for April 30. At that time an area of low pressure moved from Colorado northeastward into Iowa. During the prevalence of the southerly winds on the southeast side of the storm center, the dust was carried in great quantities northward, but when the clouds coming from the west began to drop a little rain, preliminary to the heavy northwest winds that were to follow, then the dust became mud and the rain became a very dirty rain. This succession of dust followed by muddy rain moved eastward over the greater partof Nebraska, between 1 and 5 p. m., and during most of this time the sunlight was so obscured that lamps were lighted. The muddy rains occurred in Iowa as late as 9 p. m., but preceding that, viz, about 3:30 p. m., there were one or more tornadoes. A muddy rain began at Yankton, S. Dak., at 8 p. m. On the same day the severest northerly storm of the season occurred in Montana.

Both the dust storms and the tornadoes and northers indicate that there must have been ascending and descending currents of air of great violence, such as characterize what is called the unstable condition of the atmosphere in which air that has once started to ascend or descend, continues on its way with accelerated velocity. This condition of instability is sometimes spoken of as a condition in which colder air exists above and warmer air below, so that the colder air by virtue of its greater density, presses downward with sufficient force to displace the warmer air near the ground; but this is not a correct statement of the case, as the air is always colder overhead than it is below, and the mere deficit of temperature does not constitute instability. If the temperature diminishes with altitude at the rate of 1° F. in 185 feet, the atmosphere is said to be in neutral convective equilibrium, that is to say, if a cubic yard of this air is raised upward 1,000 feet, thereby cooling about 6° F., because of the internal work done by its own expansion, it will find itself surrounded by air of the same temperature, and will have no tendency to fall back or rise further. On the other hand, if the actual temperature of the air diminishes with altitude at

a greater rate than 1° in 185 feet, then our ascending mass will, at its new altitude, find itself warmer than the surrounding air, and its buoyancy will cause it to rise still farther, and in fact, indefinitely, unless the temperature of the quiescent layers of air diminishes slowly enough to bring them back to the temperature of the ascending mass.

The rate at which an ascending mass will cool, viz, 1° in 185 feet, is called the adiabatic rate, which means that it cools, not by virtue of any abstraction or loss of heat, but by the conversion of its heat into some other form of energy.

THE PREDICTION OF TORNADOES AND THUNDERSTORMS.

In connection with the destructive tornadoes that passed over Missouri and Iowa on April 27, the Chicago Tribune says:

Nothing could have saved Kirksville, for the cloud evidently gathered near it, and was upon it before any one was aware; but might it not have been possible to warn Newtown, the next place in its course, so that its inhabitants could have taken every precaution to save themselves. Nothing would be of any avail in the immediate locality where the tornado has its beginning, but is it not possible, in these days of telephones and telegraphs, to send a warning to others in its course?

It is certain that if any such arrangement were possible, the Weather Bureau would have done this many years ago, but the time has not yet come. Already, in 1871, we began making general predictions in the well-known phrase "severe local storms are probable for the region," etc. We knew just as well then as now, that tornadoes occur on the south and east sides, and within the neighborhood of cyclonic vortices. General experience, as summed up in Finley's researches, has shown that tornadoes always whirl in the same direction, and generally advance at the rate of about 20 or 30 miles per hour for many miles toward the southeast, east, or northeast; that furthermore, if an observer sees one approaching him, his best method to escape its violence is to go into some cellar, cave, or trench, or failing in this, to go rapidly southward, as the chances are usually in favor of the storm going toward the northeast. Keep out in an open region and get down as low as possible. These are the only local precautions that can be taken to save one's life.

The great difficulties in the way of sending a warning forward to the next town are three:

First. You do not know exactly which way the tornado will move as a whole, and you may warn the wrong town; the present storm is said to have moved at first toward the northwest and then to the southeast.

Second. The tornado frequently retires to the clouds and is no longer felt on the earth.

Third. Every one, even the telegraph operator, is busy looking after his own safety, and when the word comes, "look out for the tornado," scarcely any one has the self-sacrifice or the self-possession requisite to call up "central," and spend several minutes in sending off the necessary dispatch to the next town. Once or twice it has happened that the telegraph operator has sent the word "tornado" on to the next station, but this can not be expected to happen, as a rule, in ordinary small country telegraph and telephone offices. We grant that it might be possible for the telegraph and telephone companies to organize a valuable system among their operators, by dint of a great deal of drill and a penalty for every failure. Such a system would be equally valuable when applied to severe thunderstorms, cold waves, prairie fires, earthquakes, meteors, and other phenomena that move over the surface of the earth. Some years ago, Prof. S. F. Baird attempted some arrangement of this kind with regard to the appearance of shoals of fishes, for the benefit of our fisheries. It is said that when the Morse telegraph was first built between Washington and Baltimore, it was quite common for the operators along the line to herald the approach of thunderstorms; subsequently, the progress of the floods down the Ohio, and of the breaking up of ice in the Mississippi were also similarly telegraphed by operators to river men.

But river floods and cold waves are simple matters compared with the instruction drill, watchfulness, and skill that would be requisite if the telegraph and telephone companies were to undertake anything like a satisfactory plan of tornado prediction from town to town.

Fourth. The principal difficulty consists in the fact that the telegraph and telephone stations are so far apart that three-fourths of the thunderstorms, to say nothing of the tornadoes, that are liable to pass over the central station, slip in between the outlying stations and, therefore, strike a town without being announced. It seems almost incredible, until we actually study the map, that there are so many gaps in the network of stations surrounding our principal cities, as to prevent our undertaking a satisfactory system of local thunderstorm predictions. We may illustrate this by our own experience in thunderstorm predictions for Washington. An elaborate map was prepared by the Editor in 1897 as a preliminary step toward the collection of thunderstorm data, and the organization of a system of daily thunderstorm predictions for the Capital. Every telegraph and telephone station within a hundred miles north, south, and west, was plotted down, and it was quickly found that thunderstorms whose average diameter is 5 miles would, inevitably slip through when approaching from the northwest, and could rarely be detected when approaching from the west or the north, the southwest or the south, in time to allow of any satisfactory prediction. Stations must be within a mile of each other in all directions in order to catch every tornado and determine the direction of its path in time to frame a warning that could be of any use to a central city. We have no right to issue numerous erroneous alarms. The stoppage of business and the unnecessary fright would in its summation during a year be worse than the storms themselves, so few and so small are they. However, as stated before in the MONTHLY WEATHER REVIEW, serious efforts in this direction should be made, and the local studies should be at once begun for the larger cities, such as St. Louis, Chicago, Cincinnati, Detroit, Buffalo, New York, Boston, Philadelphia, Baltimore, Washington, and New Orleans, since all these cities are surrounded by lines that are kept in good condition, and have so much at stake. At the outset, our efforts must be imperfect, but they will improve with experience. In general, we must remember that the destructive areas of tornadoes, and even of thunderstorms, are so small that the chance of being injured is exceedingly slight. For a tornado it is scarcely 1 per cent per century, that is to say, there is a certainty of being injured once in ten thousand years. This small chance renders it difficult to say how much could profitably be expended in order to avert disaster. If we grant that the chance of occurrence is exceedingly small, and the certainty of destruction is absolute when the tornado comes, then it follows inevitably that there is no material advantage to be derived from any, even the most perfect, system of forewarnings and attempts at protection. In ordinary life, we do not attempt to prevent that which is inevitable, but by a system of mutual insurance, divide up among many the loss experienced by one individual. Just so in the case of the tornado, so long as we can not possibly avoid it when it comes, the most perfect system of prediction will be of no avail, and the only method of alleviation is to be found in some method of insurance.

Inasmuch as we know that droughts and floods, storms and frosts, always have occurred in any given locality, therefore,

when we cultivate the land and plant our crops, we do so in full knowledge of the impending chances of disaster. On the one hand we have no right to expect uninterrupted immunity and prosperity, nor on the other hand when disaster comes have we any right to be discouraged and say that the land or the crop, or we ourselves personally, are accursed. Never in the history of the world has it ever been possible for any one to carry out to successful completion his schemes and plans without an intense struggle against all forms of opposition, and in this struggle, it is not so much the strongest will as it is the highest intellect that succeeds.

INTERNATIONAL COURTESY.

Several times in the history of the Weather Bureau, both under the Secretary of War and the Secretary of Agriculture, it has happened that the Bureau has found it necessary to adopt certain rules appropriate to the courteous intercourse of nations as equals. Such rules may sometimes have seemed to make science subordinate and national honor supreme. This is as it should be, although we occasionally find an unreasonable independent thinker who will not willingly submit to this or any other form of subordination.

We see no reason why science and scientists should not be amenable to the common law, to international law, and to the laws of international and individual courtesy—laws which are oftentimes not formulated but are fully recognized by all fair-minded people, juries, and judges, and which are nearly all summed up in the golden rule: "Do unto others as you would have them do unto you."

In the early history of the Weather Bureau it was clearly recognized by that most cautious diplomat, General Myer, that although his authority was absolute within the United States and under the limitation of the laws of Congress, yet it did not extend one foot beyond the seven league limit of our Atlantic and Pacific coasts, and was bounded sharply by our Mexican and Canadian boundaries. By a most courteous and generous arrangement, he secured from the Canadian Government the daily observations that he needed and gave to the Chief of the Dominion Service such observations, predictions, and warnings as would strengthen his service. Later, when he needed observations from distant oceans and countries in order to trace the complete history of our storms, he invited each nation to cooperate with him on the same basis as in the case of Canada, and every one responded most heartily. In order to strengthen this union of all nations in one great work, he subsequently presented a general request to the International Meteorological Congress of 1873 at Vienna and secured a strong vote in its favor.

In the same year, in order that our own hurricanes might be better forecast, he asked permission of the governments having colonies in the West Indies to establish Weather Bureau stations with the privilege of using his meteorological cipher system in making daily reports. In some cases this was declined, in other cases it was allowed; but in every case there was no question as to the necessity of treating each nation, large or small, with the same courtesy. About 1878, when a private party in New York gave great offence to the British Meteorological Office, great scandal to practical meteorology, and great annoyance to the British public by frequent publication in England of storms about to arrive from America, General Myer was obliged to explain that he, personally, had no authority in this matter. He could, of course, prevent the publication of unauthorized weather predictions within the United States, but could not prevent their publication in Great Britain. However, realizing that we might, as individuals, privately assist our colleagues in their dilemma, the Editor made a quite careful examination of every prediction that had been published in this unofficial manner in England, and his report, showing but 17 per cent of real verifications and about 25 per cent of partial verifications, was so widely distributed in England and so convincing that it soon became undesirable for the enterprising Anglo-American newspaper to continue such work. The intruder was defeated on his own ground and the rules of international courtesy were fully complied with. Afterwards, a daily telegram was sent from the Chief of the Weather Bureau at Washington to the Director at Paris, advising him of the condition of the atmosphere on this side of the Atlantic; and this still continues. This is simply advice to him, not a prediction for publication to the people of France. The new West Indian branch of the Weather Bureau service preserves precisely the same international comity. The respective observers inform the local insular colonies of the approach of a hurricane only when local governments desire this to be done. No act is allowed that could in any way be interpreted as an effort or willingness on our part to override local rights and the authority of the sometimes long-established local meteorological officials.

The questions that have lately excited so much public attention in reference to the relation between the meteorological observatory at Manila and the forecasts for China and Japan could easily be settled by adopting the same international courtesy that has distinguished the policy of the Weather Bureau. It would seem that, although the Spanish Government has relinquished national rights in the Philippines, yet the Jesuits at the Manila Observatory are loth to surrender their old-time privileges. Through the indulgence of the British and other colonial offices, they have for several years conducted a voluntary storm-warning system for both the Philippines and the adjacent coasts of Asia. The French, German, English, Spanish, and native authorities stood in such complex relations to each other that out of pure courtesy and conservatism, and because nobody else offered to do the work, they all allowed the voluntary work of the Manila Observatory to go on from year to year. The question now arises, whether our temporary military government in the Philippines should, or should not, respond favorably to the request of the English officials at Hongkong, to the effect that the warnings from Manila be confined to the Philippines. If the meteorologists at Manila have anything to communicate relative to storms approaching China, Japan, or colonial stations, such as Hongkong, why can not the communication be sent, as a matter of international courtesy, to the meteorological offices of those places? Why should not the latter bear the responsibility of giving proper local warnings? Why should local papers and harbormasters circulate warnings from irresponsible parties?

When we consider the uncertainty of even the best storm predictions, one must wonder that the Manila meteorologists are willing to risk their reputation by such long-range work, several days ahead, and for places a thousand miles away. We are not surprised at Dr. Doberck's complaint of the inaccuracy of the predictions and the harm that they do the public. Admiral Dewey testifies that the work at Manila has been very satisfactory, so far as he can judge from his experience in the Philippines, but he says nothing about the China coast. The publications of the Manila Observatory show a laudable energy in the study of typhoons, although based on rather scanty data. The present question is not as to the study of storms, or the ability to predict them, but as to the right of issuing public predictions that may in any way bear the stamp of official authority, as emanating from, or allowed by, or even feebly recognized by, the Government of the United States. On this point there can be no doubt. The Philippines are now, by treaty, recognized by all the world as a portion of the territory of the United States.

What we shall do with them will doubtless be decided after the present insurrection is subdued. Meantime the inhabitants must submit with the best grace they can to American laws and the laws of nations.

We are glad to learn that the meteorologists at Manila are themselves wholly of this same opinion, and have in their circulars of March 7, 1899, publicly announced that they will strictly abide by the orders of the Secretary of War through the Provost-Marshal-General of Manila.

It is not necessary to enter into the question of the relative merits of meteorological systems. Each has its own field, and must be satisfied to achieve success therein. It is disastrous to science whenever one man or one institution overrides, absorbs, or destroys the honest work of his neighbors. "Cooperation and not monopoly," is the only principle that can lead to success in the study and practice of meteorology.

RECENT EARTHQUAKES.

March 12, 4:18:47 a. m., northwest to southeast at Leon, Managua, Granada, and San Juan del Sur, all in Nicaragua.

April 5, Oakland, Cal., a light shock.

April 14, Cuyamaca, Cal.

April 16 and 18, Hydesville, Cal.

April 29 (central time), Indiana: Prairie Creek 8:00 p. m. Shelbyville, 8:00 p. m., lasting sixty seconds. Delphi, 8:05 p. m., of moderate strength; Mauzy, 8:05 p. m., two distinct shocks; the duration was about five seconds. Jeffersonville, heavy shock, 8:07 p. m. from southeast to northwest; duration twelve seconds. Princeton, slight shock, 8:03 p. m. Seymour, very distinct, 8:07 p. m.; duration seventeen seconds.

April 29, Kentucky: Henderson, 8:4:57 p. m., central time, lasting about three seconds. Irvington, about 8:00 p. m., lasting about fifteen seconds.

April 29, Illinois: A light earthquake shock was felt over the southeast part of the State; it was noticeable as far north and west as Decatur and Tuscola, and thence southeastward to Palestine and Mount Carmel. The time of its occurrence is variously given from 8:00 to 8:15 p. m., but it is probable that 8:05 or 8:06, central time, was about the correct time, and its duration about ten or twelve seconds; no damage was done.

April 30, California: Moderately heavy shock at Alvarado, Campbell, Capitola, Coyote, Gilroy, Glenwood, Hollister, Los Gatos, Niles (Centerville), Oakland, Pacific Grove, San Francisco, San Leandro, Santa Cruz, Soledad, Stanford University, Stockton.

May 16: Mr. Wm. A. Eddy reports a slight vibration observed in New York City at 2:25 p. m. and at 8:15 a. m. of the same date in Connecticut. He proposes to establish a seismic observatory and may possibly set up one of Milne's horizontal pendulum apparatus for the detection of gentle undulations.

Professor Morley reports no disturbance of his seismograph at Cleveland during April.

NATIONAL GEOGRAPHIC SOCIETY.

Meteorology and geography are so closely associated that the voluntary and regular observers of the Weather Bureau will, doubtless, many of them be glad to have their attention called to the National Geographic Society, whose Secretary, Mr. F. H. Newell, is in charge of the hydrography of the United States Geological Survey.

This Society, in return for its annual due of $2 per year, sends the National Geographic Magazine, which is one of the best mediums for obtaining and distributing general climatological and geographical information, and we commend it most heartily to observers and teachers. Any article intended for publication in that magazine should be sent direct to Mr. Newell.

THE WEATHER SERVICE OF JAMAICA, WEST INDIES.

We regret to find a note in the Jamaica weather report, No 236, for the month of February, 1899, stating that this will be the last report to be compiled and signed by Mr. Robert Johnstone, who says:

> On account of the retrenchment effected by the Government by the abolition of the present Weather Service (vide W. R., No. 236, just being issued) my services, and those of Mr. Romney will be dispensed with, and my connection with the Weather Service, which began with its establishment, and has lasted for over eighteen years, will cease at the end of the current month.

The subsequent numbers of the Jamaica reports give fuller details as to the disaster that has overtaken the service. All work now depends upon Mr. Maxwell Hall individually, and his own home, Kempshot Observatory, Montego Bay, in the western part of the island, is to be his post office address. It is difficult for us to realize what a sad blow this is to the hopes that many have fondly cherished relative to meteorology in the most beautiful spot of all the West Indies. If any one can devise any method by which to rehabilitate this service in Jamaica we hope to hear from him.

DAILY INTERNATIONAL EXCHANGE WITH MEXICO.

The Mexican daily telegraphic weather service before alluded to in the Monthly Weather Review for March, 1899, page 107, has now adopted a system of exchange with the United States.

About 30 stations telegraph daily reports direct to the Weather Bureau office at Galveston at the same time that they are sent to the headquarters in the City of Mexico. A cipher code will be used similar to that adopted in the United States.

Conversely a number of reports from Weather Bureau stations received at Galveston will be forwarded thence to Mexico. Among these stations are the following: San Diego, Yuma, Phenix, El Paso, Abilene, San Antonio, Galveston, New Orleans, Mobile, Key West.

The interchange between New Orleans and Mexico will be made over the cable of the Mexican Cable Company from Galveston to Tampico, Vera Cruz, and Coatzacoalcos. This company has for a long time been interchanging weather reports between its terminal stations, and now enters heartily into the more extensive international exchange which augurs so much for the progress of meteorology.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

During the first ten days of the month the weather on the Pacific coast was rather warm and mild; east of the Rocky Mountains, however, it was cold and unseasonable, the unfavorable conditions of the previous month continuing. During this period (1st to 10th) two storms passed across the country from the Pacific to the Atlantic in rather low latitudes for the season. As a consequence abnormally cold weather and light to heavy frosts were experienced in Texas and the Gulf and South Atlantic States. The fall of snow in southern Virginia, North Carolina, Tennessee, and along the northern border of South Carolina on the 4th and 5th, occurred during the passage of the first of the above-named storms. The occurrence of snow in April as far south as the Carolinas is an event that does not happen more than half a dozen times in a century.

The weather moderated east of the Rocky Mountains after the 11th and for the remainder of the month the temperature was generally above normal, the excess being greatest in the Lake region. In the northwest, however, especially in Montana, temperature remained below normal during the greater part of the month, the average daily deficiency at Havre being about 6°. The continued low temperature in the Northwest was especially unfortunate for stockmen, in view of the fact that the winter had been one of almost unprecedented severity. In the Southwest and on the Pacific coast, south of Eureka, temperature was above normal for the month as a whole.

The general character of the month will be seen from a study of the following tables:

TEMPERATURE OF THE AIR.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	44.2	+0.9	−1.3	−0.3
Middle Atlantic	12	51.7	+1.0	−4.7	−1.2
South Atlantic	10	59.6	−2.4	−5.4	−1.4
Florida Peninsula	7	68.8	−2.2	−2.3	−0.6
East Gulf	7	64.0	−2.4	−11.0	−2.8
West Gulf	7	65.0	−2.0	−10.2	−2.6
Ohio Valley and Tennessee	12	57.2	+1.3	−9.1	−2.3
Lower Lake	8	48.9	+4.2	−1.6	−0.4
Upper Lake	9	43.9	+3.7	−8.1	−2.0
North Dakota	7	39.3	−2.4	−15.7	−3.9
Upper Mississippi	11	52.4	+1.2	−12.0	−3.0
Missouri Valley	10	50.5	−1.6	−14.7	−3.7
Northern Slope	7	42.5	−2.1	−20.7	−5.2
Middle Slope	6	53.9	−0.2	−13.6	−3.4
Southern Slope	6	58.7	−2.1	−13.6	−3.4
Southern Plateau	13	59.9	+0.9	−0.6	−0.2
Middle Plateau	9	47.4	−1.2	+1.1	+0.3
Northern Plateau	10	45.2	−1.9	−3.7	−0.9
North Pacific	9	47.3	−1.6	−3.9	−1.0
Middle Pacific	5	54.9	+0.5	+2.2	+0.6
South Pacific	4	58.9	+0.2	+2.1	+0.5

In Canada.—Prof. R. F. Stupart says:

The mean temperature of the month was above average in the Dominion everywhere east of a line drawn north and south through Winnipeg, and below average everywhere to the westward; the greatest excess was over the more central portions of Ontario, and the greatest departure below average (6°) was in Alberta and the more western parts of Saskatchewan and Assiniboia. The temperature was decidedly below average for the first ten days in all districts between the Great Lakes and the Maritime Provinces, then abnormally high temperature became prevalent, and during the last few days summer-like conditions obtained. In the Northwest Territories the month closed cold and disagreeable, and snow was reported in many localities.

PRECIPITATION.

Precipitation was below normal. There was a small excess in a few districts, it is true, but as a general rule less than the normal amount of rain and snow fell. And this is also true for the whole country for the period January to April, both inclusive.

There was no snow on the ground at the close of the month except at mountain stations. The amount of snowfall at the latter, as determined by reports to section centers, was greater than usual, thus insuring a steady flow of water for irrigating purposes.

The numerical values of total precipitation and total depth of snowfall are given in Tables I and II, and the geographic distribution is graphically shown on Charts III and VIII.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	1.84	57	−1.4	+1.6
Middle Atlantic	12	1.42	43	−1.9	+0.8
South Atlantic	10	3.10	91	−0.3	+0.8
Florida Peninsula	7	2.68	113	+0.4	+3.1
East Gulf	7	1.98	45	−2.4	−4.2
West Gulf	7	2.85	74	−1.0	−3.5
Ohio Valley and Tennessee	12	2.45	60	−1.6	+0.3
Lower Lake	8	1.11	48	−1.2	−1.1
Upper Lake	9	1.78	78	−0.5	−2.2
North Dakota	7	1.27	64	−0.7	−1.6
Upper Mississippi	11	2.36	76	−0.7	−1.3
Missouri Valley	10	2.06	67	−1.0	−2.1
Northern Slope	7	0.85	52	−0.8	−0.1
Middle Slope	6	1.39	67	−0.7	−1.8
Southern Slope	6	2.13	110	+0.2	−2.5
Southern Plateau	9	0.25	71	−0.1	−1.5
Middle Plateau	13	0.71	88	−0.1	+0.6
Northern Plateau	10	1.21	92	−0.1	−0.3
North Pacific	9	5.60	116	+1.0	+4.0
Middle Pacific	5	0.84	34	−1.6	−1.4
South Pacific	4	0.59	42	−0.8	−1.9

In Canada.—Professor Stupart says:

The precipitation was less than average throughout the Dominion, except in eastern Manitoba and north of Lake Superior, and perhaps on Vancouver Island. Rain is now needed in southwestern Ontario and on the northwestern prairie lands, but elsewhere the ground has been well watered by melting snow and thundershowers.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 8. California, 23. Colorado, 23. Connecticut, 7, 12. Idaho, 1, 4, 17, 18, 27. Illinois, 8. Kentucky, 3, 4, 8, 9. Louisiana, 5. Massachusetts, 7, 8, 12, 16, 21, 25. Michigan, 17. Minnesota, 5, 20. Mississippi, 8. Missouri, 2, 3, 8. Nebraska, 2, 3, 8. Nevada, 24, 25, 26, 27, 28. New Hampshire, 12, 14, 16. New Jersey, 16. New Mexico, 4, 5, 29. New York, 7, 8, 17. North Carolina, 4, 5, 6. North Dakota, 13, 14, 15, 17, 19, 28. Oregon, 23, 24, 27, 29, 30. Pennsylvania, 7, 8, 16. South Carolina, 4. South Dakota, 17. Tennessee, 3, 4, 8. Utah, 2, 18, 26, 27. Vermont, 12, 14. Washington, 3, 21. West Virginia, 7, 11.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 8, 23, 24. Arizona, 4, 29. Arkansas, 3, 5, 6, 8, 15, 20, 27, 28. California, 23, 24, 25, 26, 27, 30. District of

Columbia, 16. Georgia, 7, 8, 24, 25. Idaho, 2, 27. Illinois, 15, 20, 29, 30. Indiana, 12, 28, 29. Indian Territory, 6, 18. Iowa, 13, 19, 21, 22, 27, 29, 30. Kansas, 7, 8, 13, 15, 17, 18, 19, 20, 25, 26, 27, 29, 30. Kentucky, 8, 9, 24, 25, 28. Louisiana, 20. Massachusetts, 14. Michigan, 12, 13, 14, 18, 28, 29, 30. Minnesota, 13, 26, 27, 30. Missouri, 3, 13, 17, 19, 20, 21, 26, 27, 29. Montana, 25, 26. Nebraska, 2, 8, 19, 25, 26, 27, 29, 30. New Hampshire, 21, 25. New Mexico, 4, 5, 20. New York, 12, 25, 30. North Carolina, 4, 7, 8, 25, 26. North Dakota, 26, 27. Ohio, 8, 12, 25, 28. Oklahoma, 5, 17, 18, 19, 20. Oregon, 12, 16, 17, 18, 20, 21, 22, 23, 26, 27, 28, 29, 30. Pennsylvania, 16, 26. South Carolina, 25. South Dakota, 15, 26, 27, 30. Tennessee, 3, 8, 19, 24, 25. Texas, 5, 16, 20. Utah, 2, 16, 19, 27, 28, 29. Virginia, 16, 24, 25. Washington, 2, 3, 4, 6, 9, 10, 12, 15, 16, 17, 18, 21, 22, 25, 26, 27, 28, 29, 30. West Virginia, 7. Wisconsin, 15, 27, 28, 29.

HUMIDITY.

The relative humidity of the Pacific coast, Plateau, and Rocky Mountain regions, was uniformly below normal, even in districts having a heavy rainfall.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	68	−4	Missouri Valley	66	+1
Middle Atlantic	68	+1	Northern Slope	58	+1
South Atlantic	73	+1	Middle Slope	54	−1
Florida Peninsula	74	−1	Southern Slope	52	−1
East Gulf	75	+3	Southern Plateau	27	−3
West Gulf	73	+1	Middle Plateau	42	−2
Ohio Valley and Tennessee	65	+1	Northern Plateau	58	−2
Lower Lake	67	−3	North Pacific Coast	75	−4
Upper Lake	76	+2	Middle Pacific Coast	67	−7
North Dakota	70	+2	South Pacific Coast	71	+2
Upper Mississippi	67	+2			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	27	60	w.	Mount Tamalpais, Cal.	27	72	nw.
Do	30	64	sw.	Do	28	60	nw.
Cape May, N. J	7	60	e.	Do	30	75	nw.
Carson City, Nev	18	60	w.	New York, N. Y	2	50	nw.
Do	27	50	sw.	Do	7	59	e.
Cheyenne, Wyo	17	53	nw.	Do	8	50	e.
Chicago, Ill	28	60	s.	Pierre, S. Dak	17	60	nw.
Do	29	52	s.	Do	28	52	nw.
Dodge, Kans	30	61	sw.	Point Reyes Light, Cal.	5	53	nw.
El Paso, Tex	20	50	n.	Do	12	56	nw.
Fort Canby, Wash	10	52	s.	Do	16	60	nw.
Do	17	50	se.	Do	21	63	nw.
Hatteras, N. C	4	57	n.	Do	22	70	nw.
Huron, S. Dak	28	52	nw.	Do	27	50	nw.
Independence, Cal	23	52	se.	Do	28	55	nw.
Miles City, Mont	17	54	nw.	Do	29	52	nw.
Mount Tamalpais, Cal.	10	50	n.	Do	30	60	nw.
Do	15	84	nw.	Pueblo, Colo	30	54	nw.
Do	16	72	n.	Salt Lake City, Utah	16	51	nw.
Do	17	65	n.	Sioux City, Iowa	18	54	nw.
Do	18	66	n.	Do	28	60	s.
Do	21	78	nw.	Do	30	50	se.
Do	22	78	nw.	Winnemucca, Nev	30	52	sw.
Do	23	62	nw.				

LOCAL STORMS AND TORNADOES.

Tornadoes and severe local storms occurred in northern Missouri, western Iowa, and central Nebraska, the storms being distributed over four dates, viz: 19th, 26th, 27th, and 30th.

Fifty-one persons were killed outright or received injuries from which they have since died, and probably 200 received serious wounds. The property loss was about $300,000.

The tornado which struck the town of Kirksville, Mo., about 6:10 p. m., central time, on the 27th, must take rank as one of the most severe tornadoes of modern times. Outside of the immediate vicinity of Kirksville there was but little damage from this storm, the path of great destruction being confined to a narrow strip in the town proper, about 800 feet in width, and probably a mile and a half long. In this short distance about 300 buildings were totally or partially destroyed and 34 lives lost. The storm seems to have been unusually short-lived considering its violence.

To the northeastward, in Knox County, high winds and rain were general, but no funnel cloud was observed.

Three separate and distinct tornadoes were observed a little earlier in the day to the westward of Kirksville, illustrating the tendency of tornadoes to form almost simultaneously north and south of each other, and move northeastward in parallel paths. One of the tornadoes thus observed struck the village of Newtown, Sullivan County, causing a loss of 12 lives.

The tornado observed in Holt County, Mo., on the 19th, moved a little west of north, a very unusual course. Its course is authenticated by Voluntary Observer William Kaucher, of Oregon, Mo. During the latter part of the season of 1898 a number of cases of tornadoes moving from northwest to southeast occurred, and movements due east are not uncommon. We rarely, however, find one moving toward a westerly quarter.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.0	−1.3	Missouri Valley	5.2	−0.2
Middle Atlantic	4.5	−0.7	Northern Slope	5.0	−0.4
South Atlantic	5.0	+0.6	Middle Slope	4.2	−0.2
Florida Peninsula	4.2	+0.3	Southern Slope	5.1	+0.9
East Gulf	4.5	0.0	Southern Plateau	2.8	+0.5
West Gulf	5.6	+0.4	Middle Plateau	4.9	+0.4
Ohio Valley and Tennessee	5.4	+0.1	Northern Plateau	5.9	−0.4
Lower Lake	5.0	−0.5	North Pacific Coast	7.0	+0.5
Upper Lake	5.4	−0.3	Middle Pacific Coast	4.2	−0.4
North Dakota	4.5	−1.0	South Pacific Coast	3.4	−0.5
Upper Mississippi	5.3	−0.2			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table VII, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 1,962 thunderstorms were received during the current month as against 1,505 in 1898 and 2,125 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 25th, 230; 30th, 201; 27th, 187; 26th, 177.

Reports were most numerous from: Iowa, 172; Ohio, 164; Michigan, 163; Missouri, 140.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 20th to 29th.

The greatest number of reports were received for the following dates: 9th, 7; 6th, 5; 4th and 11th, 4.

In Canada.—Auroras were reported as follows: Yarmouth, 19th; Father Point, 5th, 6th, 7th, 11th; Quebec, 3d, 4th, 6th, 9th, 10th, 24th; Kingston, 2d; Minnedosa, 10th, 12th, 16th, 25th, 30th; Qu'Appelle, 5th, 6th, 7th; Medicine Hat, 9th; Swift Current, 7th, 9th, 10th; Battleford, 24th.

Thunderstorms were reported as follows: Quebec, 30th; Toronto, 11th, 13th, 14th, 30th; White River, 14th, 27th, 29th; Port Stanley, 14th, 30th; Saugeen, 13th, 14th, 30th; Parry Sound, 14th, 30th; Port Arthur, 25th, 27th; Winnipeg, 24th, 26th; Battleford, 11th; Esquimalt, 21st.

WEATHER OF THE WEST INDIES.

There was little rain, the dry season being well marked at a majority of stations, San Juan, Porto Rico, and Santo Domingo being the notable exceptions. Rains were exceedingly light at Curaçao, Colon, and Port of Spain.

Heavy sea swell from the south and southeast was observed at St. Kitts on the 21st, 22d, 23d, 24th, and 26–30th; also at Santo Domingo on the 28–29th.

The distribution of pressure, temperature, and the resultant winds for March and April are shown on Charts IX and X, respectively, being a continuation of the series begun in the March, 1899, REVIEW.

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

Table I gives, for about 130 Weather Bureau stations making two observations daily and for about 20 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for 26 stations selected out of 113 that maintain continuous records, the mean hourly temperatures deduced from the Richard thermographs described and figured in the Report of the Chief of the Weather Bureau, 1891–92, p. 29.

Table IV gives, for 26 stations selected out of 104 that maintain continuous records, the mean hourly pressures as automatically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891–92, pp. 26 and 30.

Table V gives, for about 130 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891–92, p. 19.

Table VI gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table VII gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table VIII gives, for about 70 stations, the average hourly sunshine (in percentages) as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table IX gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table X gives the record of excessive precipitation at all stations from which reports are received.

Table XI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest pressure at or near the center at that time.

Chart III.—Total precipitation. The scale of shades show-

ing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level pressure, temperature, and resultant surface winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as formerly shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—The total snowfall. This is based on the reports from all available observers and shows the depth of the snowfall during the month in inches. In general, the depth is shown by lines and areas of equal snowfall, but in some cases figures are also given for special localities.

Charts IX and X.—Sea-level pressure, temperature, and resultant surface winds, West Indian stations, for March and April, respectively. See explanation under Chart IV.

Chart XI.—Description on page 155 (Kites).

TABLE I.—*Climatological data for Weather Bureau Stations, April, 1899.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.												Precipitation, in inches.			Wind.									
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. and 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							44.2	+ 0.9										68	1.84	— 1.4										4.0	
Eastport	76	69	74	29.92	30.01	+ .12	40.9	+ 2.3	67	28	48	26	2	34	30	36	31	70	0.89	— 2.2	5	6,601	n.	40	n.	17	14	11	5	4.5	0.6
Portland, Me.	108	81	89	29.91	30.01	+ .09	43.8	+ 0.8	71	23	52	25	1	35	30	38	31	62	1.55	— 1.5	6	5,072	nw.	30	nw.	17	15	11	4	3.5	3.1
Northfield	872	15	65	29.10	30.06	+ .10	40.0	+ 0.7	85	30	52	9	5	28	47	36	31	73	1.20	— 1.0	10	5,844	s.	32	nw.	17	10	10	10	5.4	2.0
Boston	125	115	181	29.92	30.06	+ .14	48.1	+ 3.0	83	29	57	28	3	39	38	40	31	55	1.29	— 2.1	5	7,882	w.	31	nw.	17	17	7	6	3.4	T.
Nantucket	14	43	54	30.05	30.06	+ .11	43.4	+ 0.3	60	26	49	28	3	38	17	40	36	79	1.52	— 2.1	7	7,943	sw.	48	ne.	16	12	11	7	4.6	T.
Woods Hole	22	51	57	......	......	......	43.6	+ 0.4	64	26	49	29	3	38	21	....	....	....	2.42	— 1.6	7	9,628	sw.	48	w.	7	18	7	5	3.4	T.
Vineyard Haven	....	20	55	......	......	......	46.4	0.0	69	30	55	28	3	38	25	....	....	....	3.05	+ 0.1	6	6,404	sw.	38	ne.	16	15	9	6	4.3	T.
Block Island	27	11	48	30.05	30.08	+ .14	43.9	+ 0.5	69	26	50	28	3	38	25	39	34	73	2.13	— 1.3	8	9,190	nw.	40	se.	8	18	8	4	3.1	2.5
Narragansett	....	10	....	......	......	......	44.6	+ 0.4	69	26	53	25	3	36	27	....	....	....	2.57	— 1.0	6	......	w.	....	....	...	26	2	2	....	
New Haven	107	118	140	29.96	30.08	+ .12	47.0	+ 0.9	74	26	56	27	2	38	33	41	34	65	1.79	— 1.7	5	6,479	nw.	33	se.	8	15	11	4	4.1	T.
Mid. Atlan. States.							51.7	+ 1.0										68	1.42	— 1.9										4.5	
Albany	97	84	113	29.97	30.08	+ .13	48.5	+ 2.5	82	30	58	25	6	39	36	43	38	71	1.03	— 1.5	8	5,614	s.	30	se.	19	13	11	6	4.6	T.
Binghamton	875	79	90	......	......	......	48.3	+ 2.8	85	30	59	20	6	37	39	....	....	....	0.96	— 1.3	7	4,842	nw.	29	se.	7	11	12	7	4.9	0.2
New York	314	313	346	29.74	30.08	+ .11	49.6	+ 1.5	77	26	58	31	3	42	28	43	38	67	1.23	— 2.2	4	10,423	nw.	59	e.	7	14	11	5	4.4	T.
Harrisburg	377	94	104	......	......	......	52.5	+ 2.4	81	30	63	27	3	42	32	....	....	....	1.15	— 2.3	4	5,441	w.	29	nw.	16	12	11	7	4.8	T.
Philadelphia	117	168	184	29.97	30.09	+ .11	53.4	+ 2.9	80	26	64	28	3	43	30	45	37	59	1.04	— 2.0	3	6,949	nw.	40	se.	7	13	9	8	4.4	T.
Atlantic City	52	68	76	30.04	30.10	+ .05	47.4	+ 0.6	82	14	54	28	2	40	36	44	41	82	1.27	— 2.0	4	7,528	sw.	41	nw.	16	12	14	4	4.3	T.
Cape May	24	52	70	30.09	30.11	......	47.9	— 0.3	77	14	54	30	4	42	30	43	....	....	1.03	— 2.1	5	8,557	s.	60	e.	7	15	9	6	4.0	T.
Baltimore	123	68	82	29.95	30.08	+ .10	53.8	+ 0.7	80	14	64	29	3	44	32	47	40	63	1.89	— 1.5	4	4,077	se.	30	w.	16	17	8	5	3.6	T.
Washington	112	59	76	29.98	30.10	+ .13	54.0	+ 1.0	82	14	65	27	4	43	33	46	39	60	1.54	— 1.8	4	5,271	s.	34	nw.	16	17	8	5	3.6	T.
Cape Henry	....	5	34	......	......	......	53.7	— 0.9	87	14	61	30	6	47	31	....	....	....	2.47	— 2.0	8	9,257	se.	48	nw.	16	10	12	8	5.5	T.
Lynchburg	685	83	88	29.33	30.08	+ .10	55.4	— 0.5	84	21	67	30	10	44	37	48	40	61	1.52	— 1.8	5	2,988	se.	33	nw.	16	13	11	6	4.5	T.
Norfolk	92	102	111	30.00	30.10	+ .12	55.6	— 0.6	86	14	65	33	4	46	30	50	47	79	1.95	— 2.1	7	6,709	ne.	38	nw.	16	14	11	5	4.5	T.
Richmond	144	98	105	......	......	......	57.2	......	86	14	68	34	5	47	33	....	....	....	2.04	......	4	4,743	se.	29	nw.	16	12	7	11	5.0	T.
S. Atlantic States.							59.6	— 2.4										73	3.10	— 0.3										5.0	
Charlotte	773	68	76	29.26	30.08	+ .10	57.4	— 2.3	86	30	68	31	2	47	31	50	43	64	2.51	— 1.0	11	5,092	ne.	37	nw.	1	9	9	12	5.7	T.
Hatteras	11	17	36	30.08	30.09	+ .12	55.3	— 1.9	72	30	60	37	4	50	16	51	48	81	3.99	— 0.7	9	10,009	n.	57	n.	4	15	10	5	4.5	
Kittyhawk	9	12	30	......	......	......	53.3	— 2.5	80	14	60	32	6	46	31	....	....	....	3.25	— 1.2	9	10,358	......	....	......	...	15	8	7	5.1	
Raleigh	375	93	101	29.70	30.10	+ .12	56.9	— 1.9	87	14	67	31	4	47	31	52	49	80	4.01	+ 1.5	10	4,515	ne.	24	sw.	7	10	13	7	4.9	3.5
Wilmington	78	82	90	30.01	30.10	+ .12	58.4	— 3.1	85	14	66	33	5	50	25	52	48	75	4.50	+ 1.5	8	7,313	ne.	38	ne.	20	10	11	9	5.4	
Charleston	48	14	92	30.06	30.10	+ .10	62.8	— 1.8	85	14	69	38	5	56	23	55	50	69	3.65	+ 0.1	8	9,874	e.	40	ne.	18	8	16	6	4.8	
Columbia	.....	5	....	......	......	......	60.8	— 2.2	86	14	72	32	5	50	35	....	....	....	2.43	— 0.3	5	......	ne.	....	....	...	10	8	12	5.9	
Augusta	180	89	108	29.89	30.08	+ .11	61.6	— 2.6	85	30	72	34	5	51	32	54	48	66	1.70	— 1.6	7	5,269	w.	28	sw.	8	12	10	8	4.8	
Savannah	82	63	89	30.00	30.08	+ .06	63.4	— 2.7	86	14	72	38	5	55	29	56	51	71	1.71	— 1.8	8	7,542	e.	36	nw.	4	11	12	7	4.4	
Jacksonville	43	69	84	30.03	30.08	+ .08	66.0	— 2.9	85	14	74	41	10	58	33	59	56	76	3.21	+ 0.3	5	6,239	ne.	39	sw.	7	11	17	2	4.3	
Florida Peninsula.							70.8	— 2.3										74	2.66	+ 0.8										4.2	
Jupiter	28	13	30	30.00	30.08	+ .04	70.6	— 1.4	86	1	77	46	10	64	21	64	60	74	3.11	+ 0.7	7	8,130	n.	35	s.	7	20	9	1	3.4	
Key West	22	43	50	30.02	30.04	+ .05	73.6	— 2.5	82	20	77	59	11	70	13	67	64	76	1.47	+ 0.3	4	8,027	e.	33	sw.	17	11	17	2	4.3	
Tampa	36	60	67	30.01	30.05	+ .04	68.2	— 2.9	86	27	77	46	11	60	26	61	57	72	3.39	+ 1.5	6	5,188	ne.	28	se.	7	10	10	10	5.0	
East Gulf States.							64.0	— 2.4										75	1.98	— 2.4										4.5	
Atlanta	1,131	92	126	28.90	30.10	+ .09	59.6	— 2.0	84	30	68	35	9	52	24	52	48	70	1.71	— 2.0	9	7,018	se.	32	w.	7	12	10	8	5.0	T.
Pensacola	56	78	90	30.01	30.07	+ .07	65.7	— 2.0	82	26	71	44	9	60	19	60	56	75	0.74	— 2.7	4	7,084	sw.	40	se.	6	12	11	7	4.6	
Mobile	57	88	96	30.01	30.07	+ .08	64.4	— 2.5	84	27	71	39	10	58	24	59	57	83	1.02	— 3.7	9	6,145	s.	42	se.	6	21	6	3	3.0	
Montgomery	221	100	112	29.82	30.06	+ .05	63.8	— 1.6	92	28	74	34	10	54	30	56	51	69	2.41	— 2.4	8	5,501	se.	34	nw.	4	12	10	8	4.8	
Meridian	375	84	94	......	......	......	62.6	— 3.0	90	27	73	32	10	53	35	....	....	....	1.27	— 3.5	7	4,537	sw.	26	nw.	4	10	13	7	5.0	
Vicksburg	247	65	73	29.74	30.01	+ .03	63.9	— 1.9	88	30	72	42	2	56	29	58	55	77	1.85	— 4.0	8	5,774	se.	34	nw.	4	14	9	7	4.6	
New Orleans	54	112	120	29.99	30.05	+ .08	66.6	— 2.4	86	28	74	45	8	59	23	60	57	76	1.56	— 3.6	6	6,597	se.	31	n.	4	16	5	9	4.3	
Port Eads	......	27	....	......	......	......	65.2	— 4.2	80	28	71	46	8	59	17	....	....	....	5.28	+ 2.3	7	....	e.	....	.....	...	20	1	9	....	
West Gulf States.							65.0	— 2.0										73	2.85	— 1.0										5.6	
Shreveport	249	77	84	29.73	30.00	+ .05	64.2	— 2.2	90	28	74	40	9	54	33	56	50	67	2.16	— 3.0	6	6,089	se.	30	nw.	3	7	3	20	7.0	
Fort Smith	481	63	72	29.45	29.96	+ .04	61.0	— 1.2	89	28	71	30	1	51	37	52	46	65	3.28	— 1.8	11	5,760	e.	28	nw.	8	7	7	16	6.7	
Little Rock	357	93	100	29.63	30.02	+ .06	61.0	— 2.2	89	29	70	32	1	52	34	54	49	70	3.24	— 1.5	10	5,947	s.	30	nw.	3	10	16	4	4.9	
Corpus Christi	20	42	50	29.94	29.96	+ .02	69.0	— 2.3	87	3	75	44	1	63	31	65	63	85	3.04	+ 1.5	7	11,255	se.	44	e.	5	8	17	5	4.5	
Fort Worth	670	106	114	......	......	......	61.8	......	90	28	72	31	1	51	47	....	....	....	2.32	......	5	8,971	s.	30	s.	11	7	19	4	4.9	
Galveston	54	85	96	29.93	29.98	+ .03	66.6	— 3.0	77	30	71	44	7	62	22	62	61	86	2.80	— 0.1	7	8,318	se.	36	nw.	6	9	10	11	5.4	
Palestine	510	54	61	29.43	29.98	+ .03	64.7	— 2.0	91	28	74	37	4	55	31	57	52	72	2.81	— 1.8	7	6,557	se.	28	sw.	11	9	5	16	6.4	
San Antonio	704	95	104	29.22	29.96	+ .03	68.8	— 1.3	96	27	80	38	7	58	38	59	53	68	2.60	— 0.4	7	8,116	se.	37	n.	20	9	9	12	5.2	
Ohio Val. & Tenn.							57.2	+ 1.3										65	2.45	— 1.6										5.4	
Chattanooga	762	106	112	29.28	30.09	+ .10	59.2	— 1.7	87	30	68	34	2	51	29	51	45	64	6.07	+ 1.6	10	5,835	se.	28	se.	22	5	18	7	5.6	T.
Knoxville	1,004	10	88	29.02	30.08	+ .08	57.6	— 0.6	88	30	67	30	2	48	34	50	44	67	2.68	— 2.3	10	5,530	ne.	30	w.	7	15	13	2	3.9	
Memphis	399	140	154	29.61	30.04	+ .08	62.0	— 0.1	90	27	70	36	1	54	23	52	46	60	1.38	— 4.1	10	7,956	s.	33	nw.	4	6	12	12	6.2	
Nashville	545	128	134	29.49	30.07	+ .11	58.8	— 1.0	87	28	67	29	1	50	32	52	46	67	3.25	— 1.5	10	6,011	s.	30	s.	18	9	11	10	5.6	
Lexington	990	75	102	......	......	......	55.8	+ 1.3	86	29	63	24	2	48	30	....	....	....	2.16	— 1.6	11	7,781	se.	35	n.	15	10	11	9	5.4	1.3
Louisville	525	114	136	29.48	30.05	+ .07	58.4	+ 2.0	89	29	68	27	2	49	32	50	43	62	3.50	— 1.0	10	6,470	s.	30	nw.	15	11	7	12	5.7	0.4
Evansville	434	72	82	......	......	......	58.4	......	90	29	66	26	1	50	27	....	....	....	2.64	......	9	5,712	se.	32	s.	11	11	13	6	4.4	
Indianapolis	823	154	164	29.16	30.04	+ .07	55.0	+ 2.1	86	29	64	22	2	46	27	49	44	71	1.36	— 2.4	7	7,931	s.	36	s.	11	7	16	7	5.6	T.
Cincinnati	628	152	157	29.38	30.06	+ .08	56.4	+ 1.8	87	29	65	25	2	48	29	49	42	63	1.21	— 2.0	10	5,435	se.	28	nw.	15	10	9	11	5.3	T.
Columbus	824	87	100	29.17	30.06	+ .09	55.2	+ 4.0	88	30	65	23	2	46	31	48	43	70	1.18	— 2.0	12	4,963	sw.	28	sw.	13	10	14	6	5.1	T.
Pittsburg	842	116	123	29.15	30.06	+ .07	55.0	+ 3.8	88	30	64	25	2	46	32	47	41	64	2.59	— 0.2	10	3,715	nw.	20	s.	28	10	14	6	5.2	0.2
Parkersburg	638	77	84	29.40	30.09	+ .11	56.0	+ 2.8	90	30	67	26	2	46	38	48	42	64	1.59	— 1.8	7	4,194	nw.	30	nw.	16	8	13	9	5.5	T.
Elkins	1,940	41	51	......	......	......	49.6	......	87	30	63	13	5	36	46	....	....	....	2.69	......	12	3,576	w.	25	s.	7	4	13	13	6.3	4.4
Lower Lake Region.							48.9	+ 4.2										67	1.11	— 1.2										5.0	
Buffalo	768	178	206	29.20	30.04	+ .07	47.4	+ 5.7	84	30	56	25	4	39	29	41	35	66	1.02	— 1.5	10	8,655	sw.	42	w.	14	3	20	7	6.1	3.4
Oswego	335	76	87	29.67	30.05	+ .06	45.6	+ 3.3	79	29	53	26	6	38	32	40	35	69	1.69	— 0.4	13	7,225	se.	30	se.	28	15	8	7	4.4	0.9
Rochester	523	81	90	29.47	30.05	+ .07	48.4	+ 4.9	86	29	57	24	4	40	35	41	35	63	1.66	— 0.8	10	5,197	sw.	28	sw.	14	14	8	8	4.6	4.3
Erie	714	92	102	29.28	30.06	+ .09	47.7	+ 3.6	84	30	56	23	2	39	30	43	39	74	1.08	— 1.4	11	6,693	w.	38	s.	28	12	10	8	5.2	3.7
Cleveland	762	190	201	29.22	30.05	+ .06	50.0	+ 4.3	87	30	58	21	2	42	29	44	38	65	0.99	— 1.3	10	9,168	se.	43	se.	11	12	13	5	4.4	1.8
Sandusky	629	62	74	29.36	30.05	+ .06	50.2	+ 3.2	89	30	58	21	2	43	34	44	39	67	1.02	— 1.5	10	5,729	sw.	26	nw.	14	10	6	14	6.2	0.1
Toledo	628	123	127	29.36	30.04	+ .07	51.4	+ 3.9	88	30	60	21	3	43	34	44	39	66	0.92	— 1.3	8	7,276	ne.	32	s.	18	15	8	7	4.4	0.2
Detroit	730	160	166	29.25	30.04	+ .06	50.5	+ 4.8	84	30	59	22	3	42	30	44	37	63	0.53	— 1.7	7	6,963	w.	36	s.	28	9	14	7	5.1	0.5
Upper Lake Region.							43.9	+ 3.7										76	1.78	— 0.5										5.4	
Alpena	609	61	65	29.36	30.08	+ .08	40.0	+ 2.9	72	28	48	14	2	32	25	37	33	80	2.01	— 0.2	8	6,312	se.	42	sw.	28	8	13	9	5.5	T.
Escanaba	612	43	57	29.32	30.01	+ .03	39.6	+ 3.8	77	28	48	16	5	31	34	35	32	83	3.26	+ 1.2	10	5,288	n.	37	s.	27	5	16	9	6.1	T.
Grand Haven	628	55	64	29.31	30.00	+ .03	48.0	+ 4.4	84	27	57	22	3	39	31	43	38	72	2.02	— 0.5	8	7,312	sw.	36	sw.	28	11	10	9	5.1	T.
Marquette	734	67	95	29.16	29.97	— .03	40.7	+ 3.5	76	29	48	14	1	34	31	37	34	82	2.60	+ 0.6	14	6,413	nw.	44	s.	27	7	11	12	6.1	0.3
Port Huron	639	70	108	29.35	30.06	+ .08	47.8	+ 6.1	84	30	58	21	3	38	36	42	37	73	0.77	— 1.4	5	7,681	n.	37	s.	28	11	11	8	4.7	T.
Sault Ste. Marie	624	58	65	29.31	30.01	+ .01	38.4	+ 0.7	70	29	48	11	5	29	36	35	33	85	1.85	+ 0.2	12	6,650	e.	38	nw.	14	11	7	12	5.7	0.6
Chicago	824	241	274	29.13	30.02	+ .05	50.0	+ 4.4	88	29	58	18	2	42	28	44	39	68	0.14	— 2.9	5	12,473	ne.	60	s.	28	16	8	6	4.2	T.
Milwaukee	681	124	142	29.27	30.02	+ .04	47.5	+ 4.8	86	29	57	16	2	38	38	41	36	70	0.68	— 2.2	7	7,474	ne.	36	sw.	28	8	9	13	5.4	0.2
Green Bay	617	49	57	29.31	29.99	.00	47.2	+ 4.2	82	29	58	18	3	37	37	41	36	72	3.15	+ 0.9	8	5,795	se.	34	sw.	14	11	10	9	5.2	T.
Duluth	702	95	106	29.20	29.98	— .02	39.9	+ 2.0	69	28	47	13	1	33	27	35	30	73	1.33	— 1.1	8	7,249	ne.	36	ne.	30	7	9	14	6.1	T.
North Dakota.							40.0	— 2.0										70	1.09	— 0.9										4.5	
Moorhead	935	54	60	28.93	29.97	— .01	41.8	+ 0.5	79	26	53	— 2	2	31	38	37	32	76	1.36	— 0.9	9	7,832	nw.	40	se.	26	11	12	7	4.8	1.0
Bismarck	1,674	16	29	28.16	29.98	+ .01	39.8	— 2.3	78	25	51	— 3	2	28	42	34	26	63	1.31	— 1.0	9	7,889	nw.	42	ne.	17	18	7	5	4.1	11.6
Williston	1,872	15	31	27.93	29.97	.00	38.5	— 4.1	74	25	50	— 4	2	27	40	33	27	70	0.60	— 0.8	5	7,347	n.	48	w.	26	12	13	5	4.7	4.2
Upper Miss. Valley.							52.4	+ 1.2										67	2.26	— 0.7										5.3	
Minneapolis	......	99	208	......	......	......	48.2	+ 1.1	82	25	58	12	1	38	32	....	....	...	0.57	— 2.2	4	8,245	nw.	38	e.	30	10	10	10	....	T.

TABLE I.—*Climatological data for Weather Bureau Stations, April, 1899*—Continued.

Stations.	Elevation of instruments			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. and 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Maximum velocity: Direction.	Maximum velocity: Date.					
Up. Miss. Val.—Con.																															
St. Paul	837	114	124	29.03	29.95	— .02	47.6	+ 2.4	81	25	57	12	1	38	36	41	34	64	1.35	— 1.1	8	5,589	nw.	30	nw.	13	14	11	5	4.4	0.1
La Crosse	720	70	78	......	......	.....	49.0	+ 1.6	81	25	59	15	1	39	35	....	....	....	2.88	+ 0.6	6	5,270	se.	28	w.	13	12	9	9	5.1	0.2
Davenport	606	71	79	29.33	29.99	+ .02	52.3	+ 2.6	82	28	62	17	2	43	32	45	40	67	2.94	+ 0.2	10	6,080	sw.	29	sw.	28	6	11	13	6.2	0.3
Des Moines	867	84	88	29.06	30.01	+ .06	49.8	— 0.7	82	28	60	13	4	39	40	43	37	66	2.22	— 0.6	9	6,878	sw.	42	sw.	30	9	10	11	5.1	3.0
Dubuque	698	101	109	29.23	29.99	+ .03	50.6	+ 2.0	81	28	61	17	2	40	37	43	36	63	4.24	+ 1.4	7	5,781	nw.	33	nw.	28	11	13	6	4.4	T.
Keokuk	614	64	78	29.34	30.00	+ .05	53.3	+ 1.3	83	*	62	14	1	44	32	46	41	69	3.28	+ 0.1	11	5,901	sw.	36	sw.	27	14	6	10	5.0	3.0
Cairo	359	87	93	29.64	30.03	+ .08	58.4	— 0.5	88	29	66	27	1	51	25	52	47	71	2.33	— 1.6	13	6,841	s.	36	n.	15	8	10	12	5.9	T.
Springfield, Ill.	644	82	92	29.32	30.01	+ .04	54.5	+ 1.1	88	29	64	19	1	45	29	47	41	66	1.12	— 2.6	7	7,257	s.	32	s.	30	7	11	12	6.4	3.8
Hannibal	534	75	107	......	......	......	54.6	+ 0.9	87	29	64	19	1	46	35	....	....	....	1.95	— 0.6	12	7,230	e.	39	s.	27	10	10	10	5.0	2.4
St. Louis	567	111	210	29.40	30.01	+ .06	57.8	+ 1.6	91	29	66	25	1	49	29	50	44	66	1.98	— 1.8	10	6,808	s.	39	se.	27	10	9	11	5.8	4.5
Missouri Valley.							50.5	— 1.6																							
																		66	2.06	— 1.0										5.2	
Columbia	783	4	84	......	......	......	54.2	— 3.3	88	29	65	18	4	43	40	....	....	....	2.61	— 1.9	12	6,750	se.	31	nw.	15	9	9	12	5.9	3.7
Kansas City	963	78	95	28.96	29.99	+ .05	53.9	— 0.5	86	28	63	22	4	45	32	47	40	66	3.31	+ 0.4	8	7,137	se.	39	se.	27	10	10	10	5.2	5.2
Springfield, Mo.	1,324	100	103	28.58	29.99	+ .04	55.2	— 2.3	89	29	64	22	1	46	35	49	45	74	4.79	+ 0.9	10	8,514	s.	40	s.	27	9	11	10	5.6	0.5
Topeka	......	81	....	......	......	......	53.6	— 3.2	88	13	65	20	4	43	37	....	....	....	2.41	0.0	8	......	e.	.....	.....	...	10	14	6	5.3	2.0
Lincoln	1,199	74	84	28.67	29.96	.00	50.8	— 0.6	89	28	63	17	1	39	43	43	35	62	1.49	— 1.0	7	9,195	ne.	45	se.	30	12	13	5	4.9	1.8
Omaha	1,103	92	97	28.79	29.98	+ .03	50.6	— 0.4	84	12	61	17	1	40	34	45	40	72	1.73	— 1.4	8	6,828	nw.	36	s.	28	8	11	11	6.3	1.3
Sioux City	1,139	96	164	......	......	......	49.4	— 1.2	85	12	61	15	1	38	40	....	....	....	0.96	— 2.1	7	10,640	nw.	60	s.	28	13	8	9	4.7	1.1
Pierre	1,572	50	62	28.26	29.95	— .04	45.2	— 3.9	86	25	57	5	1	34	41	36	25	53	1.67	— 0.3	9	9,553	nw.	60	nw.	17	13	7	10	4.9	4.3
Huron	1,306	56	67	28.53	29.96	— .02	44.4	— 2.0	85	26	58	7	4	30	51	37	30	67	1.04	— 1.9	6	9,343	nw.	52	nw.	28	16	6	8	4.6	2.8
Yankton	1,234	52	58	......	......	......	48.0	+ 1.3	87	12	60	14	1	36	44	....	....	....	0.61	— 2.5	6	8,024	nw.	46	sw.	26	9	17	4	4.7	1.6
Northern Slope.							42.5	— 2.1																							
																		58	0.85	— 0.8										5.0	
Havre	2,494	46	47	27.26	29.94	— .03	38.1	— 5.9	71	25	48	—11	1	28	36	33	28	72	0.43	— 0.5	9	8,188	sw.	47	w.	12	8	12	10	5.9	2.3
Miles City	2,372	41	49	27.41	29.95	— .03	41.2	— 5.4	76	16	52	— 7	1	30	41	36	31	75	2.09	+ 1.0	8	6,006	w.	54	nw.	17	6	18	6	5.5	6.7
Helena	4,108	88	93	25.77	30.03	+ .03	41.0	— 2.5	70	9	49	14	1	32	33	34	23	53	0.70	— 0.4	9	6,533	sw.	39	sw.	30	7	15	8	5.6	5.1
Rapid City	3,251	46	50	26.52	29.93	— .07	43.6	— 3.0	84	16	57	— 2	1	30	53	36	26	60	0.43	— 1.8	7	6,661	nw.	42	w.	17	15	10	5	4.2	0.3
Cheyenne	6,084	58	60	23.92	29.99	.00	41.6	+ 0.7	72	25	55	11	1	28	44	33	17	43	0.97	— 0.4	7	9,860	nw.	53	nw.	17	11	14	5	4.7	5.9
Lander	5,372	28	36	24.56	29.98	— .01	43.3	+ 0.8	74	22	58	12	3	29	43	34	20	47	0.49	— 1.8	4	4,893	sw.	48	sw.	16	8	16	6	5.6	4.8
North Platte	2,826	43	52	27.00	29.97	+ .02	49.0	+ 0.4	87	12	63	15	1	35	44	40	31	56	0.82	— 1.4	3	8,171	nw.	40	nw.	17	15	11	4	3.8	
Middle Slope.							53.9	— 0.2																							
																		54	1.39	— 0.7										4.2	
Denver	5,290	79	151	24.65	29.98	+ .02	48.8	+ 1.9	79	25	63	15	6	34	43	36	16	41	0.75	— 1.3	5	7,210	s.	48	nw.	19	20	7	3	3.2	6.7
Pueblo	4,682	74	81	25.20	29.91	— .01	51.8	+ 1.3	82	25	68	23	6	36	50	39	22	39	0.17	— 1.3	2	6,856	nw.	54	nw.	30	17	10	3	3.3	0.3
Concordia	1,398	42	47	28.47	29.97	+ .01	53.9	— 1.4	94	26	66	18	4	42	44	43	35	49	0.47	— 1.6	6	6,736	s.	38	s.	30	11	12	7	5.0	1.5
Dodge	2,504	44	59	27.33	29.95	+ .05	54.4	+ 0.7	90	10	69	18	1	40	48	43	33	55	0.55	— 1.0	6	9,903	n.	61	sw.	30	13	15	2	3.9	0.5
Wichita	1,351	78	85	28.53	29.97	+ .04	56.2	— 1.6	90	28	68	21	1	45	41	45	39	61	1.58	— 0.7	9	7,945	n.	41	s.	30	8	15	7	5.1	
Oklahoma	1,218	54	62	28.65	29.95	+ .03	58.4	— 2.0	89	10	69	26	1	48	41	51	45	69	4.81	+ 1.9	9	10,438	s.	44	n.	20	14	7	9	4.8	
Southern Slope.							59.5	— 1.0																							
																		52	1.60	— 0.2										5.1	
Abilene	1,749	45	54	28.12	29.95	+ .02	63.0	— 2.3	94	11	74	27	1	52	38	53	46	62	2.96	+ 0.2	7	8,737	se.	37	nw.	27	5	9	16	6.7	
Amarillo	3,691	54	61	26.18	29.94	+ .03	55.6	+ 0.3	88	10	70	24	1	41	46	43	27	43	0.23	— 0.7	3	13,750	s.	64	sw.	30	16	9	5	3.5	
Southern Plateau.							62.4	+ 1.5																							
																		27	0.23	— 0.1										2.8	
El Paso	3,767	10	110	26.13	29.92	+ .03	63.0	— 0.8	87	10	77	37	1	49	43	45	20	28	0.88	— 0.7	4	8,726	nw.	50	n.	20	14	8	8	3.9	
Santa Fe	6,998	47	50	23.20	29.94	+ .02	49.1	+ 2.5	71	10	61	23	6	37	33	35	8	28	0.25	— 0.5	5	5,804	sw.	43	sw.	29	22	7	1	2.5	0.3
Flagstaff	6,885	12	25	23.30	30.04	......	44.0	.....	71	15	60	13	30	28	44	36	....	....	0.25	.....	5	......	sw.	......	......	...	14	9	7	3.2	5.1
Phenix	1,076	47	57	28.73	29.85	— .02	68.8	+ 2.1	95	15	84	42	30	54	41	50	30	28	T.	— 0.3	0	3,632	e.	23	se.	13	19	7	4	2.8	
Yuma	139	16	50	29.68	29.82	— .06	71.6	+ 1.8	100	9	87	46	1	56	41	52	32	29	0.00	— 0.1	0	5,272	sw.	38	w.	28	24	3	3	1.8	
Independence	3,907	10	58	25.90	29.83	......	59.4	+ 2.1	83	8	72	33	26	47	31	42	14	21	0.02	— 0.2	1	7,832	nw.	52	se.	23	24	6	0	2.3	T.
Middle Plateau.							48.1	— 0.2																							
																		42	0.45	— 0.7										4.9	
Carson City	4,720	82	92	25.22	29.99	+ .01	48.0	— 0.2	75	8	61	18	29	35	44	38	24	44	0.13	— 0.2	4	6,690	w.	60	w.	18	15	8	7	4.7	0.6
Winnemucca	4,340	59	70	25.62	30.01	+ .05	45.7	— 1.6	77	8	59	16	26	33	40	37	25	50	0.40	— 0.6	4	8,532	sw.	52	sw.	30	6	11	13	6.4	2.5
Salt Lake City	4,344	83	90	25.58	29.99	+ .01	50.6	+ 1.1	80	9	62	30	28	39	35	38	20	34	0.81	— 1.4	5	5,356	se.	51	nw.	16	8	18	4	4.6	1.8
Grand Junction	4,608	43	50	25.31	29.95	......	53.2	......	80	18	68	25	6	39	42	41	25	41	1.11	......	4	5,132	nw.	31	nw.	2	12	15	3	3.9	0.7
Northern Plateau.							46.1	— 2.0																							
																		58	1.29	— 0.1										5.9	
Baker City	3,470	49	55	26.40	30.03	+ .01	42.6	— 2.0	68	15	53	23	28	32	35	35	25	56	1.28	+ 0.1	14	4,513	nw.	22	nw.	10	3	10	17	6.9	2.0
Boise	2,736	61	68	27.14	30.01	+ .01	48.4	— 2.5	76	15	60	29	5	37	37	40	30	57	1.50	+ 0.4	11	4,422	w.	36	e.	24	7	11	12	6.1	2.7
Idaho Falls	4,742	10	56	25.25	30.09	+ .09	43.0	— 0.8	72	9	56	17	29	30	44	36	28	63	0.44	— 1.1	9	10,377	s.	48	sw.	10	12	7	11	5.5	1.7
Spokane	1,943	99	107	27.91	29.98	— .01	46.0	— 2.0	72	15	56	28	13	36	35	38	28	55	1.53	+ 0.2	12	6,367	s.	31	sw.	11	3	17	10	6.2	T.
Walla Walla	1,018	65	73	28.92	30.02	+ .02	50.7	— 2.6	76	15	61	32	13	41	35	44	36	59	1.68	+ 0.1	11	5,814	sw.	28	sw.	12	8	20	2	5.0	
N. Pac. Coast Reg.							47.3	— 1.6																							
																		75	5.60	+ 1.0										7.0	
Fort Canby	179	10	34	29.87	30.07	+ .03	47.6	— 0.4	63	24	52	38	27	43	20	44	41	83	7.08	+ 1.6	26	9,646	w.	52	s.	10	3	7	20	7.7	
Neah	50	7	24	29.96	30.02	.00	45.0	— 2.6	66	24	50	34	*	40	27	42	40	83	11.27	+ 2.7	23	5,247	w.	38	w.	20	5	4	21	7.7	
Port Crescent	256	15	20	....	....	....	43.6	— 1.0	69	24	51	30	*	36	30	....	....	....	3.53	— 0.5	20	3,574	w.	24	sw.	9	4	16	10	6.2	0.5
Seattle	119	114	121	29.91	30.04	+ .02	48.6	— 1.3	71	8	56	35	30	42	26	43	37	69	3.50	+ 0.3	16	5,595	se.	26	s.	11	5	17	8	6.3	
Tacoma	213	113	120	....	....	....	47.2	— 1.7	71	8	54	32	5	40	28	....	....	....	4.58	+ 1.1	18	6,080	sw.	30	ne.	24	6	6	18	7.1	
Astoria	......	18	....	....	....	....	48.1	— 0.6	66	7	54	33	26	42	23	....	....	....	8.84	+ 2.8	20	....	w.	....	....	...	5	6	19	....	
Portland, Oreg	153	203	213	29.90	30.06	+ .01	48.8	— 2.8	73	7	57	31	13	41	31	43	38	70	3.73	+ 0.4	15	7,366	s.	41	s.	11	3	15	12	6.4	
Roseburg	521	56	67	29.50	30.07	+ .01	49.8	— 1.4	78	8	59	31	13	41	37	44	39	71	2.27	— 0.3	13	3,172	ne.	24	nw.	15	4	8	18	7.6	
Mid. Pac. C'st Reg.							54.9	+ 0.5																							
																		67	0.84	— 1.6										4.2	
Eureka	64	60	69	30.06	30.12	+ .07	48.2	— 1.4	58	15	53	38	17	43	17	45	42	82	1.91	— 2.2	10	5,608	nw.	38	nw.	22	8	14	8	5.0	
Mount Tamalpais	2,375	11	18	27.54	30.03	....	51.6	....	77	20	59	32	24	45	23	44	35	58	1.89	....	7	14,234	n.	84	nw.	15	13	8	9	4.7	
Red Bluff	334	54	58	29.63	29.98	— .01	60.8	+ 1.5	87	14	72	39	28	49	35	52	44	61	0.72	— 1.4	4	4,975	n.	34	nw.	22	18	7	5	3.4	
Sacramento	71	106	117	29.91	29.99	— .01	59.4	+ 1.2	84	20	70	42	24	49	31	51	44	60	0.10	— 2.2	2	6,396	sw.	30	se.	24	15	8	7	4.3	
San Francisco	153	161	167	29.87	30.03	+ .01	54.6	0.0	80	20	61	43	24	48	26	49	45	76	0.62	— 1.4	5	8,394	w.	38	w.	27	18	10	2	3.0	
Point Reyes Light	......	12	16	......	....	....	51.6	+ 1.2	80	20	58	40	23	45	35	....	....	....	0.86	— 0.8	8	17,616	nw.	70	nw.	22	12	8	10	4.8	
S. Pac. Coast Reg.							58.9	+ 0.2																							
																		71	0.59	— 0.8										3.4	
Fresno	332	67	70	29.62	29.97	— .02	61.1	+ 0.3	94	8	74	40	28	48	39	52	45	62	0.36	— 1.0	3	4,663	nw.	29	sw.	24	19	11	0	2.7	
Los Angeles	330	74	82	29.61	29.96	— .02	59.8	+ 0.9	92	20	71	42	3	49	43	52	47	76	0.18	— 1.2	2	3,394	w.	20	sw.	28	7	22	1	4.3	
San Diego	87	94	102	29.87	29.97	— .03	58.2	— 0.1	93	20	64	46	1	53	40	52	48	73	0.29	— 0.5	2	4,431	nw.	23	nw.	7	24	4	2	2.8	
San Luis Obispo	201	10	46	29.80	30.02	+ .02	56.4	— 0.4	86	20	69	32	23	44	38	49	45	72	1.54	— 0.4	3	3,984	n.	25	n.	28	15	12	3	4.0	
West Indies.																															
Basseterre	29	41	54	29.98	30.01	......	77.6	....	83	4	82	70	24	74	11	70	67	71	2.34	....	5	6,964	e.	30	e.	8	8	18	4	5.0	
Bridgetown	30	57	65	29.95	29.98	......	78.2	....	86	25	84	68	6	72	15	71	68	73	1.00	....	10	5,990	e.	24	se.	30	1	21	8	6.2	
Colon	25	37	47	29.84	29.87	......	80.6	....	86	21	85	71	17	77	13	75	73	79	0.87	....	9	6,115	n.	20	n.	9	5	20	5	5.7	
Havana	57	83	101	29.96	30.02	......	74.2	....	88	7	81	62	12	68	20	69	66	79	0.70	....	2	8,219	ne.	33	ne.	13	16	10	4	3.9	
Kingston	286	38	52	29.65	29.95	......	76.4	....	89	23	84	66	17	68	19	70	68	77	1.98	....	6	5,159	ne.	30	se.	19	8	18	4	5.1	
Port of Spain	40	65	66	29.89	29.93	......	78.8	....	90	23	87	68	10	70	20	71	68	72	0.77	....	7	4,417	e.	19	e.	8	15	14	1	4.3	
San Juan	82	48	56	29.92	30.00	......	76.6	....	90	21	83	66	4	70	16	71	69	79	6.09	+ 2.5	11	4,856	e.	21	e.	1	20	8	2	3.4	
Santiago de Cuba	82	45	51	29.87	29.95	......	78.0	....	90	22	86	64	12	70	22	70	66	70	0.78	....	7	4,225	ne.	24	n.	11	15	14	1	3.8	
Santo Domingo	59	82	88	29.94	30.00	......	75.1	....	87	15	82	63	4	68	21	70	68	79	10.26	....	11	3,431	n.	13	s.	28	15	9	6	4.2	
Willemstad	75	39	46	29.82	29.89	......	80.0	....	88	22	85	71	12	75	13	73	70	75	0.11	....	3	9,711	e.	27	e.	18	22	8	0	3.2	

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote mlumber of days missing from the record. *Two or more dates. † Received too late to be considered in departures, etc.

TABLE II.—*Climatological record of voluntary and other co-operating observers, April, 1899.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Alco	91	30	64.2	1.22	
Ashville	90	29	60.2	4.21	
Bermuda	93	31	65.2	0.43	
Birmingham	89	34	63.0	4.69	
Bridgeport	......	......	......	2.58	
Citronelle	89	40	65.8	1.01	
Clanton	......	34	......	3.98	
Daphne	87	39	65.2	0.10	
Decatur	92	29	60.8	2.41	
Demopolis	......	......	......	1.29	
Elba	94	27	63.0	0.94	
Eufaula *a*	89	31	63.1	2.71	
Eufaula *c*	......	......	......	2.37	
Evergreen	88	31	61.8	T.	
Florence *a*	......	......	......	1.95	
Florence *b*	89	32	60.2	1.89	
Fort Deposit	90	34	63.5	1.28	
Gadsden	91	27	60.2	3.21	
Goodwater	91	29	61.0	3.41	T.
Greensboro	90	34	62.3	2.74	
Hamilton	93	28	60.7	2.34	
Healing Springs	94	29	62.6	0.76	
Highland Home	88	36	63.6	1.05	
Jasper	87	27	58.4	2.74	
Livingston *a*	91	33	62.8	2.03	
Livingston *b*	90	35	63.8	2.48	
Lock No. 4	87	30	59.2	4.32	
Madison Station	90	31	60.3	3.23	
Maplegrove	89	29	59.9	3.71	
Marion	91	34	62.2	1.70	
Mount Willing	87	32	65.2	0.95	
Newbern	90	34	63.2	1.61	
Newburg	92	30	59.3	3.30	T.
Newton	89	32	61.6	4.59	
Oneonta	85	27	59.1	4.17	
Opelika	89	34	62.0	2.54	
Oxanna	86	30	60.2	2.99	
Pineapple	98	28	63.0	0.90	
Pushmataha	81	32	60.2	1.62	
Riverton	92[e]	29[e]	58.6[e]	2.67	
Scottsboro	87	29	59.8	5.04	
Selma	93	35	62.8	1.32	
Talladega	92	29	61.4	3.55	
Tallassee	......	......	......	1.83	
Thomasville	93	33	62.6	0.86	
Tuscaloosa	91	31	61.0	2.60	
Union	92	27	64.2	2.38	
Union Springs	96	34	63.4	7.00	
Uniontown	90	37	64.2	1.63	
Valleyhead	87	26	58.4	7.18	
Warrior	......	......	......	2.82	
Wetumpka	91	32	63.3	2.08	
Wilson *[1]	91	32	65.9	0.81	
Alaska.					
Skaguay	61	16	41.4	0.66	T.
Tyoonok	52	22	37.8	1.43	T.
Arizona.					
Allaire Ranch	......	......	......	0.47	
Benson	......	......	......	0.55	
Bisbee	83	35	59.8	......	
Blaisdell *[1]	105	54	74.2	0.00	
Bowie *[1]	84	46	57.4	0.02	
Buckeye	95	37	66.7	0.00	
Camp Creek	86	39	63.3	0.07	
Casa Grande *[1]	92	54	72.2	0.00	
Cochise *[1]	95	44	60.8	0.26	
Congress	88	40	65.4	T.	T.
Dragoon Summit	......	......	......	0.00	
Dudleyville	91	34	64.2	0.53	
Fort Apache	81	27	53.3	0.45	
Fort Defiance	74	21	47.1	T.	T.
Fort Grant	83	29	56.4	0.05	
Fort Huachuca	85	34	59.2	0.25	
Fort Mohave	104	43	74.0	0.02	
Gilabend *[1]	97	47	66.3	0.00	
Holbrook	84	25	54.2	0.00	
Hot Springs	98	45	68.8	T.	
Ingleside	97	40	68.7	T.	
Jerome	83	35	60.6	T.	
Maricopa *[1]	102	51	71.9	0.00	
Mesa	98	36	65.8	T.	
Mount Huachuca	81	31	59.6	0.49	
Music Mountain	94	36	64.2	0.39	
Natural Bridge	......	......	......	0.10	T.
Oracle	82	34	60.4	0.32	
Oro	......	......	......	0.16	
Oro Blanco	86	39	64.2	2.33	
Pantano	......	......	......	0.10	
Parker	105	41	72.2	T.	
Peoria	93	42	66.6	0.00	
Phenix	102	38	69.2	0.00	
Pima	89	32	62.8	0.23	
Pinal Ranch	......	......	......	1.15	
Prescott	83	11	50.2	0.00	
San Carlos	93	33	62.6	0.00	
San Simon *[1]	85	43	61.8	0.00	
***Arizona**—Cont'd.*					
Signal	101	35	67.2	0.00	
Snowflake	78	20	47.7	0.01	
Strawberry	79	12	46.6	T.	
Texas Hill *[1]	103	57	73.8	0.00	
Tombstone	84	36	62.9	0.36	
Tonto	......	......	......	0.02	
Tuba	88	31	58.4	0.50	T.
Tucson	92	36	65.7	0.62	
Vail *[5]	86	50	71.4	0.04	
White Hills	93	40	68.6	0.22	
Willcox	......	......	......	0.40	
Williams	78	20	48.8	0.10	1.0
Winslow	82	23	53.4	0.00	
Yarnell	......	......	......	0.05	
Arkansas.					
Amity	87	32	60.3	3.97	
Arkansas City	......	......	......	2.55	
Batesville	89	27	58.0	......	
Blanchard Springs	90	30	62.6	3.58	
Brinkley	89	32	59.7	2.10	
Camden *a*	......	......	......	2.81	
Camden *b*	95	34	62.6	2.60	
Canton *[1]	87	28	60.0	1.71	
Conway	96	31	62.4	3.46	
Corning	90	30	59.8	2.61	
Dallas	85	29	60.6	4.80	T.
Dardanelle	......	......	......	3.78	
Elon	89[d]	31[d]	60.2[d]	2.12	
Fayetteville	87	22	56.8	2.77	
Forrest	89	31	61.0	1.80	
Fulton	......	......	......	3.66	
Hardy	89	24	59.3	2.46	
Helena *a*	......	......	......	2.31	
Helena *b*	93	34	61.4	2.20	
Hot Springs *a*	89	32	61.2	4.01	
Hot Springs *b*	......	......	......	3.93	
Jonesboro	......	31	......	3.07	
Keesees Ferry	90	21	58.4	3.82	T.
Lacrosse	82	25	54.9	2.80	
Lonoke	88	32	61.0	4.32	
Luna Landing *[6]	88	38	63.0	2.47	
Malvern	90	32	59.8	4.08	
Marianna	90	33	62.7	2.16	
Marvell	92	35	62.4	1.81	
Moore	......	......	......	3.77	
Mossville	83	22	55.3	5.38	T.
Mount Nebo	84	25	58.1	4.15	T.
New Gascony	88	34	62.5	2.21	
Newport *a*	......	......	......	2.13	
Newport *c*	89	30	60.8	2.13	
Oregon	88	29	56.2	4.21	T.
Osceola	89	30	59.2	4.19	
Ozark	91	29	62.0	0.82	
Picayune	88	30	62.8	4.65	
Pinebluff	93	33	61.6	2.87	
Pocahontas	86	27	58.9	2.50	T.
Pond	85	19	55.6	4.16	T.
Powell	......	25	......	3.45	
Prescott	90	34	63.6	3.51	
Rison	......	32	......	2.39	
Russellville	85	31	59.0	4.29	
Silver Springs	89	19	57.3	3.65	
Spielerville	91	27	60.8	3.44	
Stamps	84	32	64.8	3.85	
Stuttgart	89	33	62.0	2.54	
Texarkana	90	34	61.2	4.42	
Warren	89	34	61.8	3.54	
Washington	86	35	61.9	4.69	
Wiggs *[1]	88	31	63.5	4.41	
Winslow	81	22	55.0	3.77	T.
Witts Springs	84	21	56.2	3.52	
California.					
Agnew	83	38	55.9	0.53	
Anada	......	......	......	1.67	
Arlington Heights	96	36	61.0	0.00	
Azusa	......	......	......	0.12	
Ballast Point L. H	......	......	......	0.10	
Bear Valley	......	......	......	2.51	16.5
Berkeley	82	41	55.4	1.56	
Bishop	87	25	56.6	0.64	2.0
Blue Lakes City	92	31	60.9	1.11	
Boca *[1]	74	20	37.2	0.85	8.5
Bodie	63	7	37.0	0.44	5.0
Bowmans Dam	......	......	......	1.73	10.0
Caliente *[1]	90	45	64.5	0.28	
Campbell	83	34	53.6	0.60	
Cape Mendocino L. H	......	......	......	0.95	
Cedarville	78	22	45.3	2.01	16.0
Centerville *[1]	89	41	59.6	0.26	
Chico *[1]	90	45	63.6	0.52	
Cisco *[1]	58	18	36.5	1.30	13.0
Claremont	91	33	58.2	0.15	
Corning *[1]	85	44	58.0	0.95	
Coronado	80	53	60.6	......	
Craftonville	95	38	64.6	0.00	
Crescent City	64	33	48.0	3.20	
***California**—Cont'd.*					
Crescent City L. H	......	......	......	3.12	
Cuyamaca	71	23	47.9	0.98	0.2
Delano *[1]	92	46	62.5	0.08	
Delta *[1]	87	40	58.2	0.65	
Drytown	89	34	60.2	0.74	
Dunnigan *[1]	84	48	63.9	0.30	
Durham *[1]	84	40	59.5	0.25	
East Brother L. H	......	......	......	0.70	
Edmanton *[1]	78	25	44.8	2.35	13.0
El Cajon	96	36	60.4	0.08	
Elsinore	108	31	62.8	0.00	
Escondido	97	30	57.8	0.29	
Fallbrook *[1]	97	43	59.1	0.16	
Folsom City *[1]	89	48	61.4	0.82	
Fordyce Dam	......	......	......	2.03	19.0
Fort Bragg	......	......	......	1.05	
Fort Ross	72	40	51.4	0.95	
Fort Tejon	......	......	......	0.55	
Georgetown	77	31	52.0	1.60	T.
Gilroy (near)	89	32	56.8	0.95	
Gilroy Hot Springs	......	......	......	0.57	
Glendora	......	......	......	0.07	
Goshen *[5]	95	43	66.8	0.28	
Grand Island *[5]	85	40	61.6	0.33	
Grass Valley	......	......	......	1.70	
Greenville	77	21	46.2	1.14	2.0
Healdsburg *[1]	91	35	54.0	0.91	
Hollister	96	32	55.8	0.55	
Humboldt L. H	......	......	......	1.50	
Hydesville	73	30	51.0	1.65	
Indio *[1]	100	57	77.0	0.00	
Iowa Hill *[1]	82	37	54.2	1.15	
Irvine	98	48	67.9	0.23	
Jackson	94	30	59.9	1.49	0.2
Jolon	......	......	......	1.74	
Keene	......	......	......	0.66	
Kennedy Gold Mine	82	29	53.4	1.53	
Kernville	......	......	......	0.37	
King City *[1]	94	40	54.1	1.16	
Kingsburg *[5]	95	45	64.0	0.40	
Kono Tayee	79	39	56.4	0.70	
Lagrange *[5]	95	40	62.6	0.35	
Lakeside	......	......	......	0.07	
Lamesa	......	......	......	0.12	
Laporte *[1]	71	27	41.3	2.92	25.3
Las Fuentes Ranch	......	......	......	0.86	
Lemoncove	95	38	63.7	0.91	
Lemoore *a* *[1]	93	42	61.8	0.22	
Lick Observatory	73	26	47.6	1.40	
Lime Point L. H	......	......	......	1.24	
Lodi	87	37	58.9	0.30	
Los Alamos	......	......	......	1.02	
Los Gatos *b*	87	32	56.2	0.60	
Malakoff Mine	82	28	53.0	1.98	1.0
Mammoth Tank *[1]	100	53	74.3	0.00	
Manzana	94	37	62.0	0.04	T.
Mare Island L. H	......	......	......	0.35	
Merced *[1]	91	44	60.3	0.30	
Mills College	......	......	......	0.86	
Milo	......	......	......	0.73	
Milton (near) *[1]	88	37	59.2	0.42	
Modesto *[1]	93	45	62.1	0.02	
Mohave *[1]	88	40	61.3	0.00	
Mokelumne Hill *[8]	......	35	53.3	1.11	
Monterey *[1]	80	49	57.0	0.50	
Morena Dam	81	27	52.6	0.24	
Mountain View	......	......	......	0.26	
Mutah Flat	......	......	......	0.50	
Napa *b*	88	35	57.2	1.00	
Needles	95	53	73.8	0.00	
Nevada City	78	29	51.2	1.52	
Newhall *[1]	94	42	62.7	0.08	
North Ontario	90	36	59.5	0.19	
North San Juan *[1]	81	31	51.1	1.36	0.2
Oakland *a*	80	41	56.3	0.78	
Ogilby *[1]	100	60	75.4	0.00	
Oleta *[1]	83	37	53.6	1.33	
Orland *[1]	92	46	64.2	0.45	
Palermo	85	37	60.0	0.16	
Paso Robles *b*	82	35	56.3	1.37	
Peachland *[5]	83	41	57.9	0.35	
Piedras Blancas L. H	......	......	......	0.89	
Pigeon Point L. H	......	......	......	0.38	
Pilot Creek	......	......	......	2.68	T.
Pine Crest	90	39	58.2	0.99	
Placerville	78	30	51.9	2.01	
Point Ano Nuevo L. H	......	......	......	0.43	
Point Arena L. H	......	......	......	0.53	
Point Bonita L. H	......	......	......	1.41	
Point Conception L. H	......	......	......	0.69	
Point Firmin L. H	......	......	......	0.40	
Point George L. H	......	......	......	0.98	
Point Hueneme L. H	......	......	......	0.73	
Point Lobos	74	42	52.0	1.05	
Point Loma L. H	......	......	......	0.00	
Point Montara L. H	......	......	......	0.84	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	Ins.	Ins.
Point Pinos L. H	.....	.....	.....	4.14	
Point Sur L. H.	.....	.....	.....	1.42	
Pomona (near)	97	38	62.0	0.10	
Poway *[3]	94	50	57.3	0.05	
Quincy	75	25	48.1	1.36	1.0
Ranch House	92	48	65.4	0.16	
Raymond	91	32	59.0	0.72	T.
Redding *b*	85	35	59.2	0.61	
Redlands	94	38	62.2	0.08	
Represa	80	38	58.8	0.74	
Rio Vista	84	39	59.2	0.28	
Roe Island L. H.	.....	.....	.....	0.15	
Romie	95	30	56.6	0.80	
Rosewood	87	33	56.9	0.90	
Sacramento *a*	86	40	60.0	0.19	
Salinas *[1]	76	48	58.3	0.72	
Salton *[1]	104	50	75.2	0.00	
San Bernardino	96	32	61.2	0.07	
San Leandro *[1]	90	47	58.6	0.82	
San Luis L. H.	.....	.....	.....	1.89	
San Mateo *[1]	85	48	56.4	1.02	
San Miguel *[1]	88	41	56.8	0.99	
Santa Barbara *a*	87	41	56.8	0.64	
Santa Barbara L. H.	.....	.....	.....	0.57	
Santa Clara *a*	.....	.....	.....	0.51	
Santa Cruz *b*	88	33	55.2	1.21	
Santa Cruz L. H.	.....	.....	.....	0.95	
Santa Maria	85	35	57.8	0.99	
Santa Monica *[1]	75	50	57.9	0.12	
Santa Paula	90	44	59.4	0.35	
Santa Rosa *[1]	83	39	54.6	0.67	
Shasta	90	31	60.2	1.41	
Sierra Madre	89	40	59.8	T.	
Sneddens Ranch	.....	.....	.....	0.50	0.2
Sonoma	.....	.....	.....	1.30	
S. E. Farallone L. H	.....	.....	.....	0.37	
Stanford University	82	37	55.0	0.45	
Stockton *a*	83	40	57.8	0.53	
Summerdale	71	22	45.4	1.70	6.0
Susanville	74	26	47.6	0.92	5.0
Tehama *[1]	84	42	61.1	0.37	
Tejon Ranch	92	40	62.3	0.18	
Templeton *[1]	87	41	57.5	1.38	
Thermalito	86	37	60.1	0.35	
Trinidad L. H.	.....	.....	.....	2.19	
Truckee *[1]	68	26	40.8	1.10	11.0
Tulare *b*	.....	.....	.....	0.20	
Tulare *c*	102	36	62.8	0.17	
Ukiah	84	33	54.1	0.56	
Upperlake	87	35	56.1	0.90	
Upper Mattole	.....	.....	.....	1.47	
Vacaville *a* *[1]	84	44	59.7	0.79	
Ventura	88	42	57.4	0.42	
Visalia *[1]	90	46	62.5	0.55	
Volcano Springs *[1]	106	60	76.6	0.00	
Walnut Creek	88	40	61.0	0.48	
West Palmdale	.....	.....	.....	0.00	
Westpoint	.....	.....	.....	1.78	
West Saticoy	.....	.....	.....	0.26	
Wheatland	85	36	58.6	0.29	
Williams *[1]	84	46	59.4	0.22	
Wilmington *[1]	85	49	60.9	0.14	
Wire Bridge *[5]	87	42	61.0	0.55	
Yerba Buena L. H	.....	.....	.....	0.53	
Yreka	81	27	49.5	0.21	
Yuba City *[5]	88	45	64.0	0.63	
Colorado.					
Alexander Lakes	.....	.....	.....	2.25	33.5
Antlers	79	20	48.6	0.87	T.
Arkins	.....	.....	.....	0.84	4.2
Boulder	78	13	49.1	1.23	8.0
Boxelder	.....	.....	.....	1.06	T.
Breckenridge	58	−15	27.4	1.31	20.2
Canyon	81	22	53.0	0.41	0.5
Castlerock	80	2	46.8	1.50	8.0
Cedaredge	83	17	49.2	0.41	1.5
Cheyenne Wells	83	15	49.8	0.03	T.
Clearview *[1]	62	4	34.9	0.53	7.5
Collbran	.....	.....	.....	0.84	11.0
Colorado Springs	79	15	47.9	0.02	0.1
Cope	82	14	49.3	1.02	5.5
Crook	84	10	49.4	2.33	2.0
Delta	83	21	50.4	0.60	T.
Dumont	.....	.....	.....	1.45	3.0
Durango	76	18	48.4	0.00	
Fairview	70	1	41.4	0.45	7.0
Fort Collins	78	8	45.1	1.10	4.8
Fort Morgan	85	14	48.2	0.50	1.5
Fox	.....	.....	.....	0.95	7.0
Garnett	70	14	40.8	0.00	
Georgetown	63	19	39.0	.....	.....
Gleneyrie	79	15	47.4	0.10	T.
Greeley	80	14	47.5	0.70	3.0
Hamps	81	15	48.1	1.30	4.5
Hoehne	83	20	51.8	0.08	T.
Holly	.....	.....	.....	T.	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	Ins.	Ins.
Holyoke (near)	85[f]	15[f]	50.2[f]	2.05	2.5
Hugo	.....	.....	.....	0.80	8.0
Husted	78	5	46.8	0.25	T.
Lake Moraine	57	−5	34.8	0.78	11.2
Lamar	90	18	55.2	0.26	T.
Laporte	.....	.....	.....	0.80	5.0
Las Animas	85	24	54.1	0.00	
Leadville (near) *[1]	58	15	33.4	0.64	9.0
Leroy	82	11	47.4	1.57	7.5
Longs Peak	60	−1	35.4	1.18	13.5
Loveland	.....	.....	.....	1.00	1.0
Mancos	75	12	45.5	0.20	2.5
Meeker	78	20	45.5	1.45	11.8
Minneapolis	90	13	51.8	0.00	
Moraine	66	2	38.9	1.39	6.0
Pagoda	75	11	42.1	1.51	13.0
Parachute	81	25	50.4	0.86	T.
Perry Park	.....	.....	.....	1.10	1.5
Rangely	76	21	46.8	0.64	3.2
Rockyford	87	18	52.7	0.28	0.5
Ruby	.....	.....	.....	2.72	41.0
Saguache	74	17	42.6	T.	T.
Salida	77	−2	45.4	0.60	6.0
San Luis	70	13	43.1	0.06	0.6
Santa Clara *[1]	73	24	45.4	0.58	7.0
Seibert	.....	.....	.....	1.05	3.0
Smoky Hill Mine	70	6	39.5	1.59	18.0
Springfield	.....	.....	.....	0.05	0.5
Strickler Tunnel	.....	.....	.....	0.54	9.5
Trinidad	.....	.....	.....	T.	T.
Troutvale	60	3	34.6	0.16	2.0
T. S. Ranch	78	23	50.2	1.56	4.0
Vilas	.....	.....	.....	T.	
Wagon Wheel	55	5	31.6	0.00	
Walden	68	−8	34.0	0.86	11.5
Wallet	.....	.....	.....	T.	T.
Westcliffe	68	13	41.3	0.39	4.0
Wray	89	21	52.0	0.62	4.0
Yuma	.....	.....	.....	0.97	6.0
Connecticut.					
Bridgeport	79	27	47.8	2.03	T.
Canton	82	23	46.1	2.03	.....
Colchester	77	23	47.8	2.74	2.0
Falls Village	.....	.....	.....	1.23	0.2
Greenfield Hill	.....	.....	.....	2.34	T.
Hartford *a*	77	26	47.4	2.90	1.0
Hartford *b*	.....	.....	.....	1.99	1.5
Hawleyville	79	23	47.2	1.73	.....
Lake Konomoc	.....	.....	.....	2.25	.....
Middletown	78	24	47.9	1.92	2.0
New London	71	29	44.8	1.45	T.
Norwalk	78	23	45.6	2.11	.....
Southington	78	23	47.2	1.90	2.0
South Manchester	.....	.....	.....	2.56	6.0
Storrs	78	21	45.6	2.20	3.0
Voluntown	76	22	45.2	2.64	1.0
Wallingford	.....	.....	.....	1.97	.....
Waterbury	82	22	46.8	1.80	T.
West Cornwall	77	21	44.6	1.47	1.8
West Simsbury	.....	.....	.....	2.04	T.
Winsted *[1]	79	24	45.4	.....	.....
Delaware.					
Millsboro	83	24	52.2	1.61	
Newark	80	24	51.3	1.63	T.
Seaford	84	27	53.4	1.48	T.
Wyoming	.....	22	.....	1.50	
District of Columbia.					
Distributing Reservoir *[5]	80	32	55.8	1.08	.....
Receiving Reservoir *[5]	79	32	54.5	1.55	.....
West Washington	83	26	54.2	1.65	T.
Florida.					
Archer	89	37	67.8	2.01	
Bartow	87	40	70.1	4.22	
Boca Raton	85	42	69.9	4.55	
Carrabelle	85[d]	42	65.4[d]	.....	
Clermont	90	45	69.8	2.66	
De Funiak Springs	94	33	65.3	1.30	
Earnestville	89	43	69.6	3.08	
Estero *[1]	86	43	70.0	.....	
Eustis	87	40	68.4	4.19	
Federal Point	86	39	66.2	7.41	
Fort Meade	90	34	66.6	3.42	
Gainesville	86	40	67.0	0.14	
Grasmere	85	40	68.4	2.74	
Homeland	84	40	66.2	.....	
Huntington	87	42	66.3	3.88	
Inverness	87	40	67.7	3.66	
Jasper	85	40	65.2	1.71	
Kissimmee	87	47	70.6	3.66	
Lake Butler	87	38	66.8	1.30	
Lake City	87	36	66.2	1.09	
Lemon City	88	46	72.3	10.75	
Macclenny	87	34	65.1	4.23	
Manatee	89	45	68.6	5.67	
Merritts Island	84	50	70.0	1.86	
Myers	86	45	70.2	1.74	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	Ins.	Ins.
New Smyrna	87	39	67.8	3.13	
Ocala	88	37	67.4	3.77	
Orange City	87	41	67.3	4.41	
Orange Park	85	38	65.6	7.92	
Orlando	85	44	68.8	3.61	
Plant City	89	40	69.1	5.70	
St. Andrews	88	34	65.4	1.92	
St. Francis	89	35	65.7	3.68	
St. Francis Barracks	83	42	64.6	5.30	
Sebastian	84	47	68.8	2.66	
Stephensville	.....	.....	.....	2.05	
Switzerland *[1]	84	38	65.3	6.22	
Tallahassee	90	38	66.0	2.01	
Tarpon Springs	85	42	68.2	4.24	
Wausau	95	32	66.8	2.53	
Georgia.					
Adairsville	84	31	57.2	2.76	
Albany	84	38	63.4	3.96	
Allentown	88[c]	34[c]	64.7[c]	3.15	T.
Americus	86	31	62.9	3.01	
Athens *b*	81	34	56.6	1.98	
Bellville	84	36	62.6	2.63	
Blakely	.....	.....	.....	3.82	
Brag	86	.....	.....	1.82	
Canton	.....	.....	.....	2.74	
Carlton	.....	.....	.....	1.73	
Cedartown	.....	.....	.....	3.29	
Clayton	83	26	55.4	5.19	T.
Covington	87	32	61.1	2.66	
Crescent	.....	.....	.....	1.61	
Dahlonega	84	25	57.2	4.54	T.
Diamond	87	25	55.2	5.02	T.
Dublin	.....	.....	.....	2.61	
Elberton	86	33	60.8	1.77	
Fitzgerald	86	35	64.0	3.02	
Fleming	90	31	62.6	1.95	
Franklin	85	33	60.4	2.23	
Gainesville	80	31	56.6	3.76	
Gillsville	84	30	58.6	2.32	
Greenbush	85	28	57.9	6.08	T.
Harrison	82	32	61.8	2.63	
Hawkinsville	90	36	63.5	2.92	
Hephzibah	.....	.....	.....	2.60	
Jesup	87	32	63.0	1.79	
Lagrange	88	30	60.0	2.08	
Leverett	92	33	61.6	0.83	
Lumpkin	88	37	63.4	3.82	
Marietta	85	32	58.8	2.76	
Marshallville	84	35	63.8	4.99	
Mauzy	89	33	65.4	3.18	
Millen	86	35	60.9	2.62	
Morgan	89	33	64.8	4.55	
Mount Vernon	.....	38	.....	2.00	
Newnan	.....	.....	.....	2.33	
Pelham	89	.....	.....	4.99	
Point Peter	83	30	56.8	1.99	
Poulan	84	30	61.6	3.91	
Putnam	87	34	62.8	2.93	
Ramsey	87	28	59.4	3.81	
Resaca	.....	.....	.....	3.54	
Reynolds	.....	.....	.....	4.97	
Rome	84	31	58.5	3.72	0.5
Talbotton	94	32	61.6	3.63	
Tallapoosa	83	31	57.6	4.30	T.
Thomasville	89	35	65.2	3.39	
Toccoa	85	31	59.6	3.25	
Washington	.....	.....	.....	1.24	
Way Cross	84	37	64.5	2.20	
Westpoint	.....	.....	.....	1.53	
Idaho.					
American Falls	74	22	45.8	0.33	
Atlanta	63	10	37.0	1.63	12.5
Blackfoot	75	15	44.2	.....	.....
Burnside	65	15	37.8	0.57	5.0
Challis	78	18	47.0	0.31	
Chesterfield	77	13	40.8	0.30	3.0
Corral *[1]	65	15	36.7	0.70	4.0
Downey	73	15	42.1	0.02	0.1
Fort Sherman	72	23	43.8	2.38	T.
Gimlet	68	10	40.0	0.95	7.3
Gray	64	10	38.3	0.70	7.0
Hagerman	84	28	50.8	0.46	
Idaho City	76[d]	15[d]	43.7[d]	1.12	7.0
Kootenai	67	20	38.2	1.91	
Lake	50	10	29.8	1.20	12.0
Lakeview	66	27	43.6	3.15	T.
Lewiston	80	29	51.2	0.17	
Lost River [j]	71	18	40.2	0.16	1.0
Marysville	68	7	34.9	0.95	
Minidoka	78	10	41.6	.....	.....
Moscow	70	27	43.3	2.95	T.
Murray	69	24	40.2	5.28	8.0
Oakley	76	18	47.2	0.10	1.0
Ola	76	24	46.4	3.40	1.5
Paris	75	5	41.6	0.45	4.5
Payette	80	25	50.6	1.00	T.

Table II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Idaho—Cont'd.					
Pollock	74	27	47.8	1.83	
Priest River	62	24	37.6	5.02	4.8
St. Maries	.....	.....	.....	4.23	0.5
Salubria	80	25	47.0	1.47	0.2
Soldier	72	13	36.6	0.32	2.0
Swan Valley	73	3	39.7	1.08	10.0
Weston	76	20	46.3	0.30	
Yellow Jacket	.....	.....	.....	0.66	
Illinois.					
Albion	90	22	56.6	1.19	T.
Alexander	90	18	54.8	1.18	5.0
Ashton	89	15	51.2	1.21	T.
Astoria	88	12	53.2	1.14	4.0
Aurora *a*	91	15	52.0	0.49	
Aurora *b*	91	14	52.0	0.61	
Beardstown	.....	.....	.....	1.30	18.0
Bloomington	95	15	54.5	0.82	T.
Bushnell	91	12	53.4	3.69	2.8
Cambridge	87	15	52.4	2.21	0.2
Carlinville	89	22	55.4	1.27	3.0
Carlyle	.....	.....	.....	1.80	
Carrollton	85	22	55.0	1.30	3.0
Charleston	88	22	54.9	0.67	0.5
Chemung	89	17	49.2	1.09	
Chester	.....	.....	.....	2.71	4.0
Cisne	90	23	56.1	1.68	T.
Coatsburg	89	20	53.1	1.34	2.5
Cobden	89	36	56.7	4.17	4.0
Danville	91	17	54.7	1.33	T.
Decatur	93	20	54.8	0.59	T.
Dixon	89	16	52.1	1.56	T.
Dwight	84[d]	8[j]	47.8[g]	0.70	T.
Effingham	90	23	55.8	1.32	2.5
Elgin	90	15	51.1	0.68	T.
Equality	94	26	55.0	3.09	3.0
Flora	90	23	55.9	1.49	2.2
Fort Sheridan	92	16	47.7	0.27	.....
Friendgrove	.....	.....	.....	0.95	4.2
Galva	87	11	51.5	1.44	T.
Glenwood *1	85[f]	18[e]	52.1[e]	0.20	
Grafton	.....	.....	.....	2.91	
Grayville	90	27	58.6	0.99	
Greenville	92	23	55.4	1.82	5.2
Griggsville	92	12	55.2	1.80	3.0
Halfway	90	24	56.2	2.99	12.0
Halliday	88	23	54.6	2.32	3.0
Havana	86	20	54.2	1.26	2.0
Henry	90	11	53.1	1.06	T.
Hillsboro	90	23	55.6	1.29	2.5
Joliet	89	14	52.2	0.35	T.
Kankakee	90	12	53.7	0.41	
Knoxville	88	9	51.1	1.55	0.5
Lagrange	92	15	51.2	0.35	
Laharpe	85	13	53.0	3.17	1.5
Lanark	83	14	50.1	2.12	T.
Loami	.....	.....	.....	1.81	5.0
McLeansboro	88	25	57.2	1.95	T.
Martinsville	87[e]	23[e]	54.4[e]	1.20	
Martinton	90	15	52.0	0.20	
Mascoutah	90	24	55.2	1.95	4.5
Mattoon	86	22	53.6	0.85	0.3
Minonk	89	8	52.0	1.58	T.
Monmouth	87	10	51.6	2.84	1.6
Morrisonville	87	23	52.4	2.25	4.0
Mount Carmel	.....	.....	.....	1.15	4.6
Mount Pulaski	93	18	55.6	0.72	1.0
Mount Vernon	88	23	54.6	2.27	T.
New Burnside	92	24	58.6	4.04	6.0
Olney	89	23	56.4	0.99	4.0
Oswego	91	14	51.7	0.46	T.
Ottawa	91	12	52.0	1.50	T.
Palestine	88	22	55.4	1.91	0.2
Pana	89	22	54.8	1.38	3.0
Paris	82	22	52.8	0.90	
Peoria *a*	.....	.....	.....	1.67	T.
Peoria *b*	92	16	54.3	1.36	
Philo	90	19	53.2	0.87	T.
Plumhill	88	26	56.1	1.42	3.0
Rantoul	91	13	53.0	0.88	T.
Raum	90	24	58.1	3.39	2.0
Riley	91	14	50.8	0.76	T.
Robinson	88	22	56.1	0.65	0.5
Rockford	86	16	49.4	1.61	
Roundgrove	88	14	52.8	2.73	
St. Charles *1	89	19	51.2	0.58	
St. John	91	25	57.2	2.67	
Savanna	95	15	52.1	1.71	
Scales Mound	81	12	48.8	4.64	T.
Streator	92	8	51.6	0.45	
Strawn	90	19	53.1	1.04	4.0
Sullivan	91	21	54.8	1.31	T.
Sycamore	88	14	50.5	0.96	
Tilden	88	22	55.8	1.30	1.0
Tiskilwa	91	13	52.2	1.03	
Tuscola	92	19	54.3	1.22	T.
Walnut	89	13	52.8	1.82	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Illinois—Cont'd.					
Wheaton *2	.....	25	50.8	0.41	
Winchester	88	20	54.5	1.71	4.0
Winnebago	85	14	50.8	2.14	T.
Indiana.					
Anderson	86	20	54.1	1.07	
Angola	87	15	51.0	0.65	
Auburn	90	16	51.6	0.69	0.2
Bedford	83	23	53.8	2.14	
Bloomington	87	22	54.6	1.96	
Bluffton	92	17	54.2	0.47	T.
Booneville	.....	.....	.....	2.48	
Bright	88	19	54.5	1.63	
Butlerville	87	20	55.4	3.15	T.
Cambridge City	86	19	52.6	1.74	T.
Columbia City *1	84	17	53.5	0.77	
Columbus	86	20	54.1	2.15	
Connersville	88	20	54.4	1.34	T.
Delphi	93	13	54.3	0.80	T.
Edwardsville *1	86	25	57.6	3.41	0.2
Fairmount	87	14	54.5	0.83	T.
Farmland	86	19	53.3	1.23	
Fort Wayne	90	16	53.7	0.70	T.
Franklin *1	88	27	55.6	0.90	T.
Greensburg	87	20	55.6	2.24	T.
Hammond	85	17	51.4	0.13	
Hector	87	18	53.9	0.97	T.
Huntington	90	19	54.0	0.71	T.
Jeffersonville	88	26	57.2	4.00	T.
Knightstown	88	19	54.4	1.43	T.
Kokomo	92	17	55.9	0.33	0.1
Lafayette	89	10	54.0	0.66	T.
Laporte	.....	13	.....	0.83	0.2
Logansport	90	15	54.6	1.21	
Madison	86	22	56.3	2.49	
Marengo	86[e]	23[e]	55.8	3.25	0.2
Marion	89	17	52.5	1.49	0.2
Markle	87	20	54.0	0.40	T.
Mauzy	86	18	53.2	1.76	T.
Michigan City *10	88	14	47.7	.....	.....
Mount Vernon	90	22	56.0	2.51	
Northfield	86	17	52.8	1.24	T.
Paoli	89	20	55.2	3.02	0.5
Peru	88	17	55.9	1.37	T.
Prairie Creek	.....	22	.....	1.18	
Princeton	90	24	56.6	1.15	0.5
Richmond	87	18	53.9	1.58	
Rockville	85	19	55.0	1.99	
Salem	86	19	53.5	2.71	T.
Scottsburg	88	25	56.8	2.81	T.
Seymour	87	22	56.5	2.85	T.
Shelbyville	.....	.....	.....	2.60	
South Bend	88	15	53.6	0.80	T.
Syracuse	87	13	53.0	1.62	0.5
Terre Haute	86	24	53.1	1.96	T.
Topeka	86	10	51.2	0.52	T.
Valparaiso	92	14	52.8	0.30	
Vevay	90	27	57.3	3.25	
Vincennes	94	23[d]	57.0	1.10	
Washington	93	24	57.3	1.50	T.
Winamac	92	11	54.1	0.59	T.
Worthington	89	21	56.2	2.70	0.3
Indian Territory.					
Hartshorne	.....	.....	.....	2.67	
Healdton	93	30	62.5	2.43	
Kemp	89[j]	24[j]	60.8[j]	5.20	
Lehigh	88	28	61.3	4.91	
Muscogee	.....	.....	.....	4.32	
Sapulpa	86	27	58.6	5.30	
South McAlester	.....	.....	.....	5.13	
Tahlequah	.....	23	.....	3.93	
Tulsa	.....	.....	.....	5.23	
Wagoner	.....	.....	.....	4.70	
Webbers Falls	.....	.....	.....	3.11	
Iowa.					
Afton	.....	14	.....	2.25	6.0
Albia	82	8	49.9	4.30	5.0
Algona *1	78	13	47.8	1.95	2.0
Alta *a*	84	11	46.6	1.17	3.0
Amana	82	12	50.2	3.04	0.4
Ames *b*	85	16	48.6	2.01	.....
Ames (near)	.....	.....	.....	2.22	3.0
Atlantic	85	4	48.3	1.69	3.0
Audubon	82	12	48.4	1.75	2.2
Bancroft	81	11	46.6	1.07	1.0
Batavia	.....	.....	.....	1.74	0.2
Baxter	.....	.....	.....	1.90	4.0
Bedford	85	1	49.8	2.91	4.0
Belknap	83	13	50.2	2.90	10.0
Belleplaine	80	13	48.6	5.76	1.5
Blockton	81	11	50.0	2.69	3.0
Bonaparte	83	10	51.0	2.44	3.0
Britt	83	10	46.5	1.63	0.9
Burlington	85	17	53.7	3.45	2.0
Bussey	.....	.....	.....	2.78	3.5
Carroll	82	12	47.3	2.28	1.8
Carson	.....	.....	.....	2.36	2.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Iowa—Cont'd.					
Cedarfalls	83[d]	15[d]	47.8[d]	2.15	0.5
Cedar Rapids	84	15	51.0	2.89	T.
Centerville	83	9	50.8	3.12	1.0
Chariton	82	10	48.6	2.79	3.2
Charles City	82	14	47.4	1.61	0.5
Chillicothe	.....	.....	.....	3.33	4.5
Clarinda	84	7	49.8	4.30	5.5
Clear Lake	84	10	47.8	2.00	2.0
Clinton	85	14	51.8	2.25	
College Springs	82	11	49.2	3.62	
Coon Rapids	80	14	48.2	1.59	0.5
Corning	81	9	49.7	2.93	2.5
Council Bluffs	85	14	50.8	1.27	2.5
Cresco	82	7	45.8	1.55	0.5
Cumberland	.....	.....	.....	1.22	2.4
Danville	.....	.....	.....	2.63	0.3
Decorah	83	12	47.8	3.46	1.0
Delaware	80	14	47.0	3.00	
Denison	84	11	47.2	2.63	0.5
Desoto	85	10	49.4	2.03	1.9
Dows	81	13	47.5	2.51	1.2
Eldon	82	9	51.8	2.11	3.2
Eldora	83	12	47.4	1.50	1.0
Elkader	85	14	49.1	2.46	
Emerson	.....	.....	.....	1.00	2.5
Fairfield	86	12	52.7	3.19	4.0
Fayette	82	11	47.2	3.87	0.7
Forest City	80	10	46.4	1.18	
Fort Madison	.....	.....	.....	3.95	4.0
Galva	83	12	47.2	1.09	T.
Garden Grove	83	4	47.0	3.67	9.0
Gilman	.....	.....	.....	2.81	T.
Gladbrook	.....	.....	.....	2.44	
Glenwood	87	10	50.9	3.51	2.2
Grand Meadow *1	78	15	47.1	4.18	0.2
Greene	85	12	48.5	1.47	T.
Greenfield	83	12	48.4	2.38	3.2
Grinnell	80	15	49.2	5.05	.....
Grinnell (near)	82	13	49.0	5.22	4.0
Griswold	.....	.....	.....	1.56	3.5
Grundy Center	84	17	48.4	1.76	T.
Guthrie Center	83	12	48.6	1.25	0.5
Hamburg	.....	.....	.....	5.07	1.0
Hampton	83	15	48.0	2.14	2.5
Harlan	83	11	48.8	4.21	2.0
Hawkeye	.....	.....	.....	3.31	0.8
Hedrick	82[i]	10[e]	48.0[h]	2.70	3.0
Hopeville	80	11	48.8	4.08	.....
Humboldt	84	8	48.6	1.26	
Independence	81	13	48.0	3.45	T.
Indianola	82	14	50.0	3.70	1.2
Iowa City	84	13	51.4	3.23	1.0
Iowa Falls	83	14	47.2	1.74	2.0
Keosauqua	82	10	51.6	3.26	6.0
Knoxville	82	15	50.6	3.57	5.0
Lacona	.....	.....	.....	1.97	0.5
Lamoni[d]	80	27	52.8	2.60	T.
Lansing	83	14	50.2	4.12	
Larchwood	.....	.....	.....	2.11	2.5
Larrabee	86	6	46.2	1.39	4.0
Leclaire	.....	.....	.....	2.64	
Lemars	84	12	48.4	0.98	2.0
Lenox	81	10	49.0	2.22	2.5
Lockridge	.....	.....	.....	2.88	3.0
Logan	85	14	50.2	2.08	
Maple Valley	.....	.....	.....	1.84	2.0
Maquoketa	83	16	50.1	1.36	
Marshall	82	15	49.1	2.12	1.0
Mason City	82	11	45.5	1.81	
Melrose	.....	.....	.....	0.77	6.0
Monticello	82	14	49.4	3.81	
Mooar	83	9	50.8	3.08	3.0
Mountayr	82	7	49.0	3.11	6.0
Mount Pleasant	83	12	51.8	2.27	
Mount Vernon *a* *1	84	14	51.2	3.39	
Mount Vernon *b*	82	15	51.5	3.40	0.7
Murray	.....	.....	.....	2.97	T.
New Hampton	83	13	48.6	2.89	
Newton	81	15	48.6	4.52	5.2
Northboro	.....	.....	.....	2.09	5.0
North McGregor	.....	.....	.....	0.80	
Northwood	82	9	46.6	0.56	
Odebolt	84	13	48.8	2.35	
Ogden	83	12	48.2	1.62	0.6
Olin	81	11	49.4	2.83	0.2
Onawa	85	14	49.7	1.09	0.5
Osage	80	11	46.8	1.93	0.9
Osceola	82	12	48.8	3.61	3.0
Oskaloosa	84	12	50.3	2.76	3.5
Ottumwa	83	12	50.2	2.19	0.2
Ovid	82	8	49.3	3.21	4.5
Pacific Junction	82	10	49.2	2.92	4.8
Pella	80	14[e]	47.5[e]	3.62	2.0
Plover	85	6	47.4	0.82	
Primghar	85	10	47.0	1.50	
Redoak	83	9	51.6	2.39	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	Ins.	Ins.
Ridgeway	84	12	48.6	2.40	0.7
Rockwell City	84	10	47.9	1.90	1.4
Ruthven	81	8	46.1	0.78	3.0
Scranton	82	15	49.0	1.49	T.
Sheldon	86	7	47.4	1.55	2.6
Sibley	85	10	45.9	1.30	2.0
Sigourney	85	9	49.6	2.76	3.2
Spencer	83	5	45.1	1.09	2.0
Spirit Lake	88	11	47.3	0.65	T.
Storm Lake	79	6	45.6	1.70	1.5
Stuart	82	10	48.4	1.37	0.8
Tara	85	17	53.6	1.85	1.0
Thurman	89	13	51.5	3.37	6.8
Toledo	83	13	48.6	3.18	2.0
Villisca	84	4	49.0	3.38	7.0
Vinton *[1]	82	18	49.2	2.96	0.5
Wapello	85	11	52.4	1.64	
Washington	83	7	49.8	2.81	
Washta	......	......	......	1.28	1.0
Waterloo	82	15	48.3	2.38	0.8
Waverly	83	17	49.6	2.14	1.1
Westbend *[1]	84	10	46.1	1.50	T.
Westbranch	80	14	47.3	2.47	0.5
Westunion	......	......	......	2.11	
Whitten *[1]	84	18	47.2	1.97	1.5
Wilton Junction	82	14	51.2	3.45	
Winterset	83	13	48.2	2.40	T.
Woodburn	......	......	......	2.58	3.6
Kansas.					
Abilene	72	25	54.3	1.28	1.0
Achilles	......	......	......	0.56	2.0
Altoona *[3]	85	23	54.0	3.34	
Anthony	......	......	......	1.34	
Atchison *a*	87	14	52.8	1.66	4.0
Atchison *b* *[1]	86	17	53.7	2.40	2.5
Augusta	90	17	56.6	1.06	
Baker	85	8	50.0	3.36	
Burlington	89	20	55.6	1.49	0.5
Campbell	93	14	53.0	1.21	1.5
Centropolis	......	......	......	2.55	3.0
Chanute	88	22	54.4	2.97	
Colby	90	13	50.2	0.34	1.5
Columbus	86	20	54.8	7.26	
Coolidge	91	18	52.9	0.25	
Cunningham	98	21	57.2	1.16	T.
Delphos	95	18	53.9	1.00	0.3
Dresden	88	19	49.8	1.38	4.0
Ellinwood	94	18	54.8	0.91	T.
Emporia	84	22	55.4	0.85	T.
Englewood	99	16	57.4	0.46	T.
Eureka	......	......	......	1.51	
Eureka Ranch	96	15	52.6	0.51	0.5
Fallriver	87	17	52.4	2.59	T.
Fanning	84	3	49.2	2.29	0.1
Fort Riley	90	18	51.6	0.70	0.1
Fort Scott	90	20	54.2	3.79	
Frankfort	90	9	52.6	3.09	2.0
Garden City	92	18	53.6	1.00	2.0
Garfield	......	......	......	0.36	
Gibson	94	16	52.4	0.51	T.
Gove *[1]	92	19	54.0	0.74	0.5
Grenola	90	16	55.6	2.53	
Halstead	91	18	54.8	1.44	
Hays	94	15	52.4	0.40	
Horton	84	13	52.4	1.90	2.0
Hutchinson	93	25	56.4	1.58	1.0
Independence	86	22	56.2	7.32	
Lawrence [1]	86	23[e]	53.9	1.65	4.0
Lebanon	94	12	49.7	1.00	2.0
Lebo	88	20	54.6	1.47	T.
Macksville	95	11	53.7	0.45	
McPherson	96	21	55.6	2.91	
Manhattan *b*	94	17	55.2	0.93	1.4
Manhattan *c*	93	17	55.4	0.99	2.5
Marion	92	11	55.6	1.20	0.5
Meade	......	......	......	T.	
Medicine Lodge	97	24	58.0	1.15	T.
Minneapolis	96	15	53.6	0.90	0.7
Morantown	82	21	54.6	2.66	T.
Mounthope *[1]	90	28	54.4	1.59	
Ness City	92	20	55.0	0.48	
Newton	89	17	55.3	1.30	T.
Norwich	......	20	......	1.45	
Oberlin	......	......	......	1.15	1.5
Olathe	83	14	54.7	1.79	
Osage City	89	15	53.8	1.27	1.0
Osborne	......	......	......	1.02	
Oswego	86	23	57.0	5.07	0.2
Ottawa	86	14	53.8	1.89	0.2
Paola	86	16	52.7	1.10	0.7
Phillipsburg	90	18	53.4		
Pittsburg	87	21	56.2	3.68	T.
Pratt	93	18	54.9	0.76	T.
Rome *[1]	91	19	56.8	1.89	
Russell	95	10	54.3	0.70	0.5
Salina	95	19	54.6	0.97	1.0

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	Ins.	Ins.
Sedan	88	20	54.6	4.51	
Seneca	86	13	51.0	2.67	3.0
Toronto	88	18	53.7	1.81	
Ulysses	93	......	......	0.05	0.5
Valley Falls	87	14	53.8	1.68	2.5
Viroqua	92	25	55.8	0.02	T.
Wamego *[1]	90	18	52.7	1.24	2.0
Wellington	88	26	57.4	1.34	
Winfield	94	24	57.0	1.78	
Winona	......	......	......	0.50	
Yates Center	......	16	......	2.37	T.
Kentucky.					
Alpha *[3]	......	24	55.2	3.95	0.3
Ashland	89	27	56.8	......	T.
Bardstown	91	25	56.6	2.97	
Blandville	86	25	57.0	3.77	0.1
Bowling Green *b*	87	25	58.9	4.14	
Burnside	......	......	......	4.75	T.
Canton *[1]	91	30	59.4	2.78	
Carrollton	91	28	58.4	1.54	
Catlettsburg	95	28	57.6	2.69	
Earlington	92	26	58.4	2.59	0.5
Edmonton	86	26	57.0	4.42	1.0
Ensor	89	25	56.7	2.33	
Eubank	90	22	55.4	4.17	
Falmouth	......	......	......	1.79	T.
Fords Ferry	89	27	57.4	3.97	1.0
Frankfort	87	27	57.2	2.39	T.
Georgetown	86	24	57.1	......	......
Greensburg	90	26	56.8	4.02	
Henderson	91	28	60.0	2.90	T.
Hopkinsville	92	26	58.8	3.05	T.
Irvington	87	25	57.5	4.41	0.5
Jackstown	89	25	54.4	3.00	
Leitchfield	87	26	57.0	3.88	2.0
Loretto	87	2[illegible]	56.8	2.59	T.
Marrowbone	89	26	57.8	3.16	T.
Maysville	94	24	55.6	1.84	T.
Middlesboro	91	25	55.6	3.75	0.2
Mount Hermon	84	24	56.5	4.28	T.
Mount Sterling	88	26	55.6	3.94	T.
Owensboro	90	27	57.9	2.26	T.
Owenton	86	24	55.6	2.91	
Paducah *a*	......	......	......	3.38	T.
Paducah *b*	93	27	59.7	3.65	T.
Princeton	92	28	58.3	3.70	
Richmond	90	24	55.6	3.16	T.
Russellville	96	20	57.8	3.47	T.
St. John	86	24	56.8	4.02	1.0
Scott	86	22	54.6	1.49	T.
Shelby City	92	23	57.4	3.44	T.
Shelbyville	92	24	58.4	2.14	T.
Vanceburg	88	25	55.2	1.35	
Williamsburg	89	28	56.0	4.23	
Louisiana.					
Abbeville	85	43	65.8	5.12	
Alexandria	91	35	64.8	1.89	
Amite	91	35	65.1	2.00	
Bastrop	92	33	64.4	1.65	
Baton Rouge	90	39	65.8	2.24	
Calhoun	91	34	62.9	1.69	
Clinton	90	34	65.0	1.15	
Como	......	......	......	3.67	
Covington	89	31	64.4	1.70	
Donaldsonville	91	39	65.8	3.70	
Elm Hall	90	40	67.4	4.93	
Emilie	87	37	66.2	3.25	
Farmerville	89	34	62.2	2.74	
Franklin	88	40	66.2	4.13	
Grand Coteau	90	40	66.8	3.01	
Hammond	91	37	66.0	2.46	
Houma	90	40	67.6	2.08	
Jeanerette	88	36	64.0	9.70	
Jennings	86	40	65.8	6.35	
Lafayette	87	40	65.8	4.05	
Lake Charles	86	35	63.2	2.33	
Lake Providence	......	36	......	1.38	
Lawrence	90	42	67.2	1.91	
Liberty Hill	92	36	64.0	2.19	
Mansfield	93	33	62.4	3.32	
Melville	......	......	......	2.20	
Minden	92	30	61.0	2.87	
Monroe	87	39	62.5	1.83	
Montgomery	91	36	65.1	1.78	
New Iberia	86	42	64.4	6.55	
Oakridge	89	35	63.4	4.18	
Opelousas	87	38	63.8	3.30	
Paincourtville	92	38	67.0	3.39	
Plain Dealing	90	31	62.5	2.11	
Plaquemine	91	40	65.6	2.85	
Rayne	88	38	65.1	4.35	
Robeline	92	32	63.8	5.10	
Ruston	89[f]	34[f]	62.0[f]	1.74	
Schriever	91	37	67.0	3.92	
Shellbeach	87	41	67.4	5.67	
Southern University	85	39	63.6	2.80	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Louisiana—Cont'd.	°	°	°	Ins.	Ins.
Sugar Ex Station	89	43	65.8	1.90	
Sugartown	89	40	65.8	3.62	
Venice	82	42	65.2	3.28	
Wallace	92	37	66.4	2.99	
White Sulphur Springs	......	......	......	2.67	
Maine.					
Bar Harbor	76	21	43.2	1.09	0.5
Belfast *[6]	69	29	46.3	1.79	3.0
Calais	76	20	42.2	0.62	4.0
Cornish *[1]	83	25	43.3	0.98	5.5
Cumberland Mills	79	21	45.2	......	......
Fairfield	84	20	43.9	1.05	2.0
Farmington	87	14	42.8	0.92	5.5
Flagstaff	83	3	38.0	0.67	6.0
Gardiner	85	21	45.0	1.19	3.8
Kineo	76	13	37.9	......	......
Lewiston	86	21	43.7	1.48	4.2
Mayfield	83	16	41.9	0.99	6.0
North Bridgton	86	17	42.8	1.81	7.0
Orono	84	18	44.2	0.66	0.5
Petit Menan *[1]	57	28	42.8	......	......
Winslow	85	20	44.0	1.00	4.0
Maryland.					
Annapolis	82	29	55.0	0.98	T.
Bachmans Valley	81	21	50.4	2.35	T.
Boettcherville	94	20	54.5	1.65	T.
Boonsboro *a*	87	24	55.1	0.83	
Boonsboro *b*	85	24	53.6	1.24	
Cambridge	82	32	55.4	1.50	
Chase	80	22	50.8	1.92	
Chestertown	78	28	51.8	1.25	
Chewsville	82	22	52.0	0.95	
Clear Spring	83	25	51.5	1.29	T.
Coleman	80	28	52.8	1.40	
Collegepark	84	27	54.2	1.71	
Cumberland	89	30	57.4	2.25	T.
Darlington	81	27	52.3	1.65	
Deerpark	81[d]	14[d]	46.2[d]	1.65	T.
Denton	83	28	53.2	1.42	
Easton	82	27	52.4	1.11	
Ellicott City	82[f]	24	52.0[e]	2.29	T.
Fallston	79	25	51.7	1.88	T.
Frederick	83	26	53.7	1.43	
Frostburg	89	20	53.4	3.40	2.2
Grantsville	85	18	47.4	2.21	4.0
Greatfalls	83	24	52.4	1.58	
Greenspring Furnace	85	22	52.3	1.22	T.
Hagerstown	85	22	54.2	0.85	
Hancock	90	20	53.8	1.61	T.
Harney	......	......	......	1.75	......
Jewell	84	26	53.4	1.27	
Johns Hopkins Hospital	79	27	52.4	2.01	
Laurel	88	25	54.3	2.08	
Mardela Springs	82	25	53.0	1.81	
Mount St. Marys Coll.	82	30[e]	54.4[e]	1.44	T.
New Market	85	23	54.0	1.04	T.
Port Deposit	88	24	53.6	0.90	
Princess Anne	82	24	52.2	1.98	
Rockhall *b*	79	25	52.2	1.08	
Sandy Point	......	25	......	1.60	
Smithsburg *a*	83	23	53.2	0.67	
Smithsburg *b*	84	24	53.6	1.27	T.
Solomons	85	31	52.6	1.27	
Sudlersville	82	29	53.9	1.77	
Sunnyside	87	14	48.0	2.46	4.0
Takoma Park	84	27	54.8	1.85	T.
Taneytown	81	23	53.0	1.84	T.
Van Bibber [e]	79	27	51.0	2.24	T.
Westernport	88	25	53.8	1.93	0.5
Westminster	81	24	51.5	1.60	T.
Woodstock	82	24	53.2	1.74	T.
Massachusetts.					
Adams	81	17	46.2	......	......
Amherst	80	20	45.6	1.73	0.5
Attleboro	......	......	......	2.01	......
Bedford	84	23	46.7	1.71	T.
Bluehill (summit)	80	24	45.9	1.54	1.0
Cambridge	82	26	47.7	1.37	
Chestnut Hill	84	26	47.6	1.47	0.5
Cohasset	......	......	......	1.38	T.
Concord	83	24	45.4	1.50	2.0
Dudley [1]	78[f]	23[d]	48.4[d]	2.26	......
East Templeton *[1]	79	23	43.9	1.09	8.0
Fallriver	74	26	47.4	2.28	T.
Fiskdale	......	......	......	2.02	......
Fitchburg *a* *[1]	80	26	44.9	1.07	2.5
Fitchburg *b*	82	24	45.9	1.64	2.0
Framingham	82	24	47.6	1.73	T.
Groton	81	20	44.2	2.04	4.0
Hyannis *[1]	67	26	43.8	1.55	
Jefferson	......	......	......	2.13	6.0
Lawrence	83	25	46.2	1.95	0.5
Leeds	83	19	44.9	1.93	T.
Leicester Hill	80	21	46.9	0.81	3.0
Leominster	......	......	......	1.59	3.5
Long Plain	......	......	......	1.64	......

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
***Massachusetts*—Cont'd.**					
Lowell *a*	82	25	46.0	1.50	......
Lowell *b*	85	24	45.4	......	......
Ludlow Center	75	11	42.0	2.40	T.
Middleboro	78	20	44.9	1.88	......
Monson	80	20	46.2	1.25	3.0
New Bedford *a*	74	28	45.6	2.08	
New Bedford *b*	74	25	45.6	1.98	
New Salem	79	21	44.6	1.93	8.9
Pittsfield	76	18	44.6	0.87	......
Plymouth *[1]	80	25	44.1	1.37	
Princeton	......	......	......	1.74	9.0
Provincetown	73	28	45.8	0.57	
Salem	......	......	......	1.76	T.
Somerset *[1]	78	25	48.0	1.89	
South Clinton	......	......	......	2.08	2.0
Springfield Armory	81	23	49.0	2.37	2.5
Sterling	......	......	......	1.80	2.5
Taunton *b*	77	23	45.9	1.74	
Taunton *c*	77	21	45.0	2.06	
Turners Falls	80	20	44.9	1.38	......
Webster	......	......	......	2.32	1.0
Westboro	83	21	47.2	1.82	1.0
Weston	82	25	46.2	1.50	0.4
Williamstown	80	18	43.8	1.58	......
Winchendon	......	......	......	1.23	3.5
Worcester *a*	77	26	45.5	1.92	2.0
Worcester *b*	83	21	47.6	2.13	2.5
Michigan.					
Adrian	88	17	50.2	0.59	T.
Agricultural College	86	10	49.8	1.23	T.
Allegan	88	15	51.7	0.38	1.5
Alma	88	10	48.3	0.81	T.
Ann Arbor	88	15	50.8	0.21	T.
Arbela	85	11	46.9	0.88	T.
Badaxe	87	15	45.8	0.79	
Baldwin	90	5	47.9	0.95	T.
Ball Mountain	87	16	48.9	0.48	2.0
Baraga	68	1	38.0	1.45	
Battlecreek	90	14	51.9	1.33	0.2
Bay City	86	......	......	1.21	
Berlin	84	16	46.9	0.49	0.5
Berrien Springs	89	15	52.4	0.96	1.0
Big Point Sable *[10]	68	14	44.5	......	......
Big Rapids	87	9	50.4	1.21	0.5
Birmingham	87	20	50.6	0.64	
Boon	86	4	44.2	1.84	3.0
Calumet	68	12	39.4	2.49	0.2
Camden	94	12	51.0	1.69	
Carsonville	82	12	44.6	0.44	
Charlevoix	88	8	40.2	2.51	T.
Cheboygan	86	10	41.9	2.22	T.
Clinton	90	16	50.6	0.44	T.
Coldwater	88	14	51.8	0.74	
East Tawas	76	13	42.2	......	
Eloise	88	23[d]	50.2	T.	T.
Ewen	82	0	40.4	3.47	
Fairview	86	14	51.0	0.16	T.
Fitchburg	85	10	49.4	0.63	T.
Flint	85	15	48.6	1.00	
Frankfort	78	20	50.4	T.	
Gladwin	86	7	46.6	1.65	
Grand Rapids	90	15	51.8	0.77	
Grape	89	18	51.2	0.40	T.
Grayling	88	5	44.5	0.50	2.0
Hanover	86	12	50.4	0.84	1.5
Harrison	86	4	47.2	0.98	
Harrisville	75	11	40.8	0.87	0.1
Hart	84	15	49.2	1.70	
Hastings	89	7	50.2	1.84	T.
Hayes *	87	5	44.0		
Highland Station	......	......	......	1.03	1.5
Hillsdale	88	13	50.4	0.87	T.
Holland *[10]	86	19	49.2	......	
Humboldt	76	−8	37.6	4.09	....
Ionia	88	13	49.2	0.99	T.
Iron Mountain	82	10	44.2	4.63	0.4
Ishpeming	78	10	40.6	2.63	0.3
Ivan	88	11	47.3	1.22	1.0
Jackson	88	17	51.1	0.69	
Jeddo	86	15	46.3	0.68	T.
Kalamazoo	87	15	54.3	2.03	1.0
Lake City	86	6	48.8	T.	
Lansing	86	16	50.4	1.93	
Lathrop	77[c]	0[c]	38.6[c]	1.45	T.
Ludington	83	12	36.3	0.65	
Luzerne	87	6	44.6	1.68	T.
Mackinaw	83	10	36.8	2.05	
Madison	90	18	51.0	0.48	0.1
Mancelona	82	4	45.0	2.70	4.0
Manistique	69	12	37.8	3.00	T.
Middle Island *[10]	68	15	39.8	......	
Mottville	88	12	50.8	0.57	T.
Mount Clemens	89	20	49.0	0.30	T.
Mount Pleasant	87	9	45.0	1.05	
Muskegon	85	14	47.9	0.75	T.
Newberry	79	10	37.0	......	......
***Michigan*—Cont'd.**					
North Manitou Island *[10]	80	24	42.1	......	......
North Marshall	87	10	50.0	0.65	
Northport	80	12	44.2	1.40	1.0
Old Mission	88	16	46.0	1.83	0.7
Olivet	85	16	50.0	1.47	T.
Omer	84	1	42.0	1.20	
Ovid	87	11	49.3	1.56	
Petoskey	93	7	41.8	2.19	2.0
Plymouth	89[j]	19	54.0[e]	0.27	T.
Port Austin	82	−2	43.0	0.90	
Reed City	84	8	46.7	2.10	
Rockland	84	11	43.6	3.59	1.5
Rogers	89	7	39.8	0.47	
Romeo	85	17	49.5	0.80	T.
Saginaw	89	14	48.8	0.98	
St. Ignace	70	9	34.2	1.54	
St. Johns	87	15	50.0	1.90	1.0
St. Joseph	90	18	50.6	1.10	T.
Sandbeach	78	11	42.8	0.88	
Sidnaw	79	2	38.6	1.64	3.0
Somerset	87	11	50.0	0.55	T.
South Haven	84	16	49.0	1.06	T.
Stanton [j]	88	8	46.2	0.20	
Thomaston	90	2	44.6	......	......
Thornville	87	16	50.6	0.67	
Thunder Bay Island *[10]	62	16	39.8	......	......
Traverse City	88	8	44.0	1.79	
Valley Center	85	12	46.0	1.45	1.0
Vandalia	87	20	51.2	1.10	0.3
Vassar	87	10	48.8	0.93	
Vermillion Point *[10]	70	10	32.0	......	......
Wasepi	88	13	51.0	0.60	0.1
Waverly	89	13	50.6	0.47	0.1
Wetmore	76	5	39.4	2.36	
White Cloud	90	2	48.8	1.20	
Ypsilanti	87	17	50.5	0.33	T.
Minnesota.					
Ada	81	−12	41.6	1.61	0.2
Albert Lea	80	10	45.7	1.65	T.
Alexandria	82	0	42.1	1.17	......
Beardsley	83	3	44.7	1.24	1.1
Bermidji	79	−7	38.8	2.37	2.8
Bird Island	83	5	43.9	0.54	T.
Blooming Prairie	82	6	46.0	1.55	
Brainerd	83	−2	43.2	2.80	1.0
Caledonia	80	9	46.6	3.06	T.
Camden	86	4	43.7	1.57	
Campbell	86	1	44.6	0.90	
Collegeville	82	7	46.2	0.98	0.6
Crookston	77	−7	40.6	1.92	4.0
Deephaven	......	......	......	0.83	
Detroit City	78	−12	38.3	1.57	3.0
Farmington	83	5	45.7	2.04	T.
Fergus Falls	77	2	42.6	1.15	3.3
Glencoe	81	1	44.1	0.08	
Glenwood	84	7	45.9	0.80	
Grand Meadow	84	6	45.0	0.61	T.
Granite Falls	83	9	43.6	1.78	
Hallock *	80	1	38.0	......	......
Lake City	85	12	48.2	1.57	T.
Lake Jennie	88	4	45.0	2.02	T.
Lakeside	81	7	45.8	1.35	
Lake Winnibigoshish	78	2	38.4	1.78	1.5
Leech Lake	79	−10	39.9	2.33	2.3
Leroy	85	11	48.3	......	......
Long Prairie	81	0	43.6	2.02	0.1
Luverne	82	10	46.0	1.49	2.5
Lynd	84	11	50.0	1.11	T.
Mapleplain *[1]	85	7	46.1	0.90	T.
Milaca	86	7	44.4	0.87	
Milan	83	5	45.3	2.25	0.2
Minneapolis *a*	85	11	46.7	1.15	T.
Minneapolis *b*[1]	83*	9	46.1	0.93	T.
Minnesota City *[1]	85	10	49.4	1.24	
Montevideo	86	5	46.2	2.65	
Morris	81	5	45.0	1.73	0.5
Mount Iron	75	5	40.7	1.68	0.2
Newfolden	76	0	37.4	2.24	1.8
New London	80	4	43.4	0.78	
New Richland *[1]	83	10	46.4	......	......
New Ulm	82	8	46.0	0.94	T.
Park Rapids	78	−8	38.1	2.35	3.7
Pine River	76	−3	40.3	1.77	2.0
Pipestone	79	7	43.8	0.93	1.2
Pleasant Mounds	85	7	47.2	0.67	T.
Pokegama Falls	76	−17	39.2	2.13	0.9
Redwing	......	......	......	0.71	
Reeds	......	......	......	1.05	
Rolling Green	80	10	45.2	0.50	T.
St. Charles	82	5	46.4	1.13	T.
St. Cloud	82	8	47.0	2.22	T.
St. Olaf	88	2	43.5	1.47	3.0
St. Peter	80	10	46.8	0.22	T.
Sandy Lake Dam	79	−9	40.1	1.28	......
Shakopee	81	10	48.0	0.70	
Tower	78	−9	41.2	2.00	3.0
***Minnesota*—Cont'd.**					
Two Harbors	68	13	38.2	3.19	T.
Wabasha *[1]	83	14	47.7	1.14	T.
Willmar	80	6	44.3	2.05	T.
Willow River	85	−2	42.8	1.25	0.6
Winnebago City	85	10	46.2	0.12	
Worthington	79	8	45.2	1.00	1.5
Zumbrota [1]	82[a]	2	46.8	......	......
Mississippi.					
Aberdeen	89	31	59.0	1.43	
Agricultural College	91	36	64.1	1.50	
Americus	92	40	67.0	3.41	
Austin	90	32	61.6	2.08	
Batesville	93	31	60.8	1.65	
Bay St. Louis	85	41	65.4	1.27	
Biloxi	81	40	64.3	0.62	
Booneville	85	32	59.0	2.64	
Briers	......	......	......	1.63	
Brookhaven	96	33	64.6	1.30	
Burke	92	33	62.0	2.23	
Canton	92	35	63.2	1.88	
Columbus *a*	......	......	......	1.64	
Columbus *b*	90	33	61.4	1.38	
Corinth	87	30	57.2	4.11	
Crystal Springs	92	35	63.6	1.93	
Edwards	93	35	64.3	2.32	
Fayette	......	36	......	3.20	
Fayette (near) *[1]	88	43	66.0	......	
Greenville *a*	89	39	62.2	2.24	
Greenville *b*	91	38	62.6	2.19	
Greenwood	91	40	63.6	2.31	
Hattiesburg	93	36	66.0	0.46	
Hernando	90	30	60.9	1.60	
Holly Springs	90	31	59.2	2.39	
Jackson	94	35	62.4	2.78	
Kosciusko	91	33	62.0	T.	
Lake	92	30	61.9	0.69	
Leakesville	95	29	65.4	1.08	
Logtown	88	37	65.4	1.20	
Louisville	91	29	60.4	1.36	T.
Macon	94	34	62.0	1.13	
Magnolia	91	34	64.2	0.97	
Moss Point	87	40	68.4	......	
Natchez	90	36	65.4	1.80	
Okolona	93	27	59.5	2.59	
Palo Alto	93	31	63.2	1.76	
Pontotoc	90	31	61.5	2.17	
Ripley	89[h]	27[h]	56.2[h]	3.20	
Rosedale	90	36	62.8	1.12	
Stonington *[1]	88	40	66.8	......	
Thornton	......	......	......	2.24	
Tupelo	......	......	......	2.69	
University	93	33	62.0	1.60	T.
Walnut Grove	......	......	......	1.62	
Water Valley *[1]	94	32	62.2	3.53	T.
Waynesboro	91	31	62.6	1.95	
Windham	94	34	63.6	2.04	
Woodville	90	36	64.8	2.00	
Yazoo City	96	36	63.9	2.41	
Missouri.					
Appleton City	89	22	55.4	3.77	2.0
Arlington	......	......	......	4.00	3.0
Arthur *[3]	......	28	54.3	3.44	T.
Avalon	84	10	51.8	3.05	2.5
Bagnell	......	......	......	4.57	....
Bethany	83	9	49.7	3.42	7.0
Birchtree	88	19	55.8	6.00	T.
Boonville	......	......	......	4.41	3.1
Brunswick	84	15	52.4	3.30	6.0
Carrollton	84	18	52.2	4.27	6.0
Conception	81	15	50.6	2.36	6.0
Cook Station	89	15	55.5	......	......
Cowgill *[5]	82	10	53.4	4.55	7.0
Darksville	90	15	52.6	3.00	2.0
East Lynne *[3]	......	18	51.4	2.99	5.0
Edgehill *[5]	86	20	54.0	5.99	4.0
Eightmile *[1]	86	21	54.0	3.15	4.0
Eldon	88	21	54.7	3.29	3.0
Elmira	84	10	50.4	3.30	5.0
Fairport	......	......	......	1.93	3.0
Fayette	84	17	52.7	3.84	4.0
Fulton	......	......	......	3.20	4.0
Galena	......	......	......	3.71	
Gallatin *[1]	84	12	51.7	4.62	6.0
Gayoso	91	30	59.0	2.08	
Glasgow	86	16	53.6	3.87	......
Gordonville *[3]	......	26	54.3	4.13	
Gorin	......	......	......	1.92	3.0
Halfway	89	20	56.2	3.76	
Harrisonville	87	15	51.8	2.45	3.6
Hazelhurst	......	......	......	3.64	3.5
Hermann	......	......	......	2.96	4.0
Houston	89	20	56.2	5.14	1.0
Houstonia	......	......	......	4.31	3.5
Irena	......	......	......	2.52	3.5
Ironton	89	18	54.4	3.81	6.0
Jefferson City	96	21	54.4	3.44	3.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Kidder	82	6	50.8	4.70	2.9
Lamar	89	22	57.0	4.11	T.
Lamonte	...	...	...	3.99	2.5
Lebanon	89	20	55.9	3.60	2.0
Lexington	87	16	54.4	4.04	4.0
Liberty	84	15	50.4	6.88	5.0
Louisiana	91	20	55.1	1.62	4.1
McCune *1	90	22	55.0	2.80	8.0
Marblehill	87	19	55.5	2.57	2.0
Marshall	85	17	52.6	2.93	5.0
Maryville	84	10	48.8	3.34	5.0
Mexico	91	16	54.6	2.29	6.8
Miami *5	82	18	53.8	3.49	4.8
Mineralspring	88	16	54.6	4.14	T.
Montreal	88	20	54.2	4.66	1.5
Mount Vernon	90	21	56.8	5.41	T.
Neosho	88	18	55.4	4.35	T.
Nevada	...	...	...	3.82	T.
New Haven	91	22	56.0	2.71	7.0
New Palestine	87	19	54.4	2.73	3.0
Oakfield	89	22	57.0	4.91	8.0
Olden	88	17	54.8	5.43	T.
Oregon *a*	85	10	51.9	3.95	3.7
Oregon *b*	85	11	52.8	3.48	3.0
Palmyra *5	88	16	54.4	3.44	3.6
Phillipsburg *1	89	17	54.2	4.15	0.4
Pickering *3	...	8	47.6	4.94	5.5
Poplarbluff	90*f*	23*f*	59.2*f*	2.75	
Potosi	89	12	53.0	3.00	8.0
Princeton	81	10	50.8	3.95	11.0
Rhineland	90	17	55.8	3.15	5.0
Richmond	87	13	52.8	4.55	6.0
Rolla	...	...	...	5.75	2.0
St. Charles	90	23	55.8	2.62	4.2
St. Joseph	...	...	...	1.79	6.0
Sarcoxie *3	...	24	52.4	5.72	
Sedalia	86	15	53.5	3.80	2.0
Seymour	88	20	53.9	5.51	T.
Shelbina	...	...	...	3.70	3.0
Sikeston	89	28	57.0	3.25	1.0
Steffenville	87	9	53.3	3.47	2.5
Stellada	85	19	53.8	5.22	3.0
Sublett	82	8	50.4	6.60	6.5
Trenton	82	12	51.1	4.69	8.0
Unionville	8	10	51.8	4.13	1.0
Vichy	94	17	55.2	4.35	1.2
Warrensburg	87	17	53.8	3.69	T.
Warrenton	90	20	54.2	2.46	T.
Wheatland	...	...	...	3.91	1.0
Willow Springs	88	18	55.6	4.07	
Wylie	91	18	57.1	4.18	T.
Zeitonia	89	19	56.8	3.69	2.0
Montana.					
Adel	65	5	36.8	1.78	13.8
Billings	80	8	47.0	T.	T.
Butte	62	22	37.6	1.57	15.7
Canyon Ferry	70	16	42.2	1.35	...
Castle	59	− 2	34.2	0.30	...
Chinook	72	0	38.5	0.54	
Corvallis	74	20	46.0	0.09	...
Crow Agency	77	2	44.2	1.58	6.0
Dearborn Canyon	66	− 4	37.0	1.30	13.0
Deer Lodge	75	11	39.4	...	...
Dell	66	14	38.8	0.20	...
Dupuyer	70	− 2	35.9	...	...
Ekalaka	77	−11	36.4	0.44	4.4
Fort Benton	76	− 5	39.2	1.30	...
Fort Keogh	79	−12	40.4	2.20	T.
Fort Logan	61	11	36.8	0.42	...
Glasgow	69	−19	36.2	0.89	...
Glendive	82	− 6	43.0	2.05	12.0
Glenwood	63	13	38.9	2.02	...
Greatfalls	70	7	43.0	1.41	1.2
Kalispell	62	21	40.3	0.78	0.5
Kipp	63	− 9	36.2	1.19	11.2
Lewistown	67	− 1	40.6	1.85	6.0
Livingston	72	12	42.9	0.50	T.
Manhattan	70	12	41.6	0.46	4.0
Martinsdale	66	1	38.4	0.35	3.5
Missoula	72	26	43.4	1.15	0.5
Parrot	70	22	41.8	1.93	1.0
Plains	67	23	42.5	0.30	T.
Poplar	72	−11	38.3	0.77	T.
Redlodge	66	8	37.0	0.50	5.0
Ridge	80	−11	39.0	0.86	8.0
St. Ignatius	71	22	44.0	0.89	T.
St. Pauls	68	− 6	38.5	0.76	0.5
Shelby 4	69	− 7	38.0	0.40	1.0
Troy	73	23	44.0	2.22	...
Utica	78	3	38.2	2.29	9.0
Yale	69	− 4	38.2	T.	T.
Nebraska.					
Agee *1	88	15	47.3	1.50	T.
Albion	86	12	49.3	0.73	
Alliance	...	...	...	0.75	
Alma	92	20	52.6	1.96	T.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ansley	88	15	50.1	2.20	
Arapaho *1	95	24	52.4	0.10	
Arborville	...	...	...	1.15	T.
Ashland *a*	86	16	51.0	1.00	...
Ashland *b* *1	87	19	51.8	1.65	1.5
Ashton	...	...	...	1.75	T.
Auburn	86	14	52.1	2.81	2.5
Aurora *1	87	18	50.0	1.08	T.
Bartley	...	...	...	0.46	T.
Bassett	...	...	...	1.42	1.0
Beatrice	90	17	50.2	0.96	0.8
Beaver City	93	16	52.6	0.50	
Bellevue	...	...	...	2.17	1.4
Benedict	...	...	...	1.48	
Benkleman	...	...	...	0.20	2.0
Blair	85	13	48.3	1.24	0.5
Bluehill	...	...	...	1.52	
Bradshaw	...	...	...	1.25	T.
Brokenbow	...	...	...	1.30	
Burchard	...	...	...	1.20	4.0
Burwell	...	...	...	0.42	T.
Callaway	73	27	46.8	0.55	
Camp Clarke	85	15	47.6	0.53	T.
Central City	...	...	...	1.25	T.
Chester	...	...	...	0.58	T.
Cody	...	...	...	T.	T.
Columbus	87	15	49.0	0.34	
Creighton	86	12	47.6	1.04	
Crete	88	18	51.8	1.16	2.1
Culbertson	...	...	...	0.45	0.5
Curtis	87	13	47.2	0.26	
David City	87	14	53.4	...	...
Dawson	86	10	52.6	1.52	0.5
Dunning	...	...	...	0.00	
Eden	...	...	...	1.63	1.3
Edgar *a* *5	82	20	54.0	0.97	
Elba	...	...	...	0.55	0.5
Ericson *1	86	10	47.0	1.85	T.
Ewing	...	...	...	1.58	0.5
Fairbury	90	17	51.5	1.03	T.
Fairfield	...	...	...	1.75	T.
Fairmont	88	15	49.1	1.58	0.5
Fort Robinson	80	8	46.2	1.30	T.
Franklin	91	6	51.7	1.25	
Fremont	85	14	49.6	2.15	1.5
Geneva	89	22	51.3	1.64	1.0
Genoa	87	12	50.0	1.08	0.4
Gering	83	15	47.4	0.41	0.1
Gordon	...	...	...	0.70	
Gothenburg	...	...	...	0.41	
Grand Island *a*	...	...	...	0.82	T.
Grand Island *b*	88	14	51.4	1.00	T.
Grand Island *c*	88	19	50.8	1.03	...
Greeley	...	...	...	1.10	T.
Haigler	...	...	...	0.87	2.0
Hartington	87	10	46.0	0.31	0.5
Harvard	85	15	49.8	1.39	0.2
Hastings *1	84	19	49.0	1.00	T.
Hayes Center	...	...	...	0.34	T.
Hay Springs	82	− 5	43.5	1.56	T.
Hebron	93	18	52.0	0.79	0.6
Hickman	...	...	...	2.16	3.2
Holdrege *1	84	10	52.2	T.	
Hooper *1	86	18	50.0	1.36	0.2
Hubbard	...	...	...	1.43	T.
Imperial	88	12	54.2	0.64	1.0
Johnstown	...	...	...	0.10	T.
Kearney	...	...	...	0.25	
Kennedy	85	2	46.6	0.41	
Kimball	80	18	46.0	0.65	6.5
Kirkwood *1	87	14	46.7	0.71	2.0
Lexington	90	15	48.8	0.47	
Lincoln *b*	88	16	52.0	1.52	2.6
Lincoln *d*	88	20	52.6	...	...
Lodgepole	88	10	46.6	1.10	1.0
Loup *1	88	14	48.5	1.24	
Lynch	97	11	53.2	1.54	0.8
Lyons	...	...	...	1.10	T.
McCook	...	...	...	0.05	0.5
McCool *1	90	16	50.0	1.64	0.5
Madison	86	4	47.6	0.71	0.5
Madrid *5	90	15	45.0	0.30	
Marquette	...	...	...	0.65	0.5
Merriman	...	...	...	T.	
Minden *a*	89	14	50.0	1.23	0.4
Minden *b*	...	...	...	1.13	...
Monroe	...	...	...	1.11	0.4
Nebraska City *b*	...	...	...	4.80	2.0
Nebraska City *c*	85	16	51.3	4.63	...
Nemaha *1	86	14	51.6	3.09	2.0
Nesbit	85	10	47.4	0.45	0.5
Norfolk	87	10	47.8	0.48	0.8
North Loup	88	10	49.6	1.75	
Oakdale	86	13	48.0	1.42	0.2
Odell	...	...	...	0.81	
O'Neill	88	16	47.6	1.14	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ord	...	...	...	1.21	
Osceola	...	...	...	0.22	T.
Ough	...	...	...	0.27	0.1
Palmer *b*	...	...	...	0.40	
Palmyra	...	...	...	2.72	2.1
Paxton	...	...	...	0.40	
Plattsmouth *a*	...	...	...	3.23	0.4
Plattsmouth *b*	...	...	...	3.04	2.0
Pleasant Hill	...	...	...	1.69	1.5
Ravenna *a*	88	12	50.2	0.86	T.
Redcloud *a*	...	...	...	1.82	...
Redcloud *b* *1	84	10	48.8	0.63	0.8
Republican *1	86	24	51.2	1.85	
Rulo	...	...	...	1.75	T.
St. Libory	...	...	...	0.43	
St. Paul	...	...	...	0.60	
Salem *1	82	16	52.8	1.20	
Santee Agency	89	11	49.4	2.31	3.8
Sargent	...	...	...	0.42	
Schuyler	...	...	...	0.62	0.5
Seneca *1	80	18	48.4	...	
Seward *1	87	20	51.3	2.05	0.8
Spragg	...	...	...	0.81	0.1
Springview	85	9	46.4	0.96	...
Stanton	...	...	...	1.33	
State Farm	90	16	51.4	1.51	0.8
Stockham	...	...	...	1.00	
Strang *1	89	18	51.5	2.00	T.
Stratton	...	...	...	0.42	1.0
Superior *5	86	24	57.0	1.55	
Syracuse	...	...	...	2.00	1.5
Tablerock	...	...	...	1.47	2.5
Tecumseh *b*	88	13	50.1	3.20	...
Tecumseh *c*	...	...	...	3.78	1.0
Tekamah	86	13	48.5	1.92	
Thedford	...	...	...	0.20	
Turlington	84	17	50.7	3.38	4.8
Valentine	85	0	47.4	0.74	...
Valparaiso	...	...	...	2.45	1.8
Wakefield	87	13	48.4	0.76	1.6
Wallace	...	...	...	0.10	
Weeping Water *1	83	11	47.1	2.49	4.0
Wellfleet	96	22	53.2	0.75	T.
Westpoint	87	14	50.3	1.33	T.
Whitman	...	...	...	1.20	
Wilber *1	86	22	50.4	1.75	T.
Willard	...	...	...	0.39	T.
Wilsonville *1	86	16	50.7	0.40	
Wisner	...	...	...	1.63	T.
Wymore *1	86	22	53.5	2.06	T.
York *1	89	22	51.7	1.30	
Nevada.					
Battle Mountain *1	80	30	49.8	0.20	2.0
Beowawe *1	85	27	45.4	0.30	3.0
Bunkerville	...	...	...	0.50	
Carlin *1	70	28	40.1	0.15	1.5
Carson City	77	17	48.2	0.30	0.8
Clover Valley	...	...	...	0.84	6.5
Cranes Ranch	...	...	...	0.47	
Elko *1	75	28	39.5	0.20	0.5
Elko (near)	69	13	41.4	0.10	1.0
Ely	74	20	45.2	0.50	5.0
Empire Ranch	78	20	45.5	0.06	2.0
Fenelon *1	70	24	40.7	0.64	8.0
Golconda *1	58	28	40.8	0.60	5.0
Halleck *1	78	23	45.0	0.50	5.0
Hawthorne *b*	83	24	51.8	0.20	3.0
Hot Springs	...	...	...	T.	
Humboldt *1	80	30	49.6	0.27	2.5
Lee	...	...	...	0.46	2.0
Lewers Ranch	75	20	47.8	0.65	6.5
Los Vegas	81	34	56.6	0.44	
Lovelocks *1	79	36	50.9	T.	T.
Martins	76	19	48.8	0.28	0.8
Mill City	82	30	45.4	0.15	1.5
Monitor Mill	74	21	46.0	0.46	4.8
Palisade *1	81	32	53.2	0.47	3.5
Palmetto	77	12	46.8	0.30	3.0
Reno *1	80	27	49.8	T.	T.
Reno State University	78	23	49.0	0.21	...
St. Clair	82	25	49.9	0.35	2.0
Silverpeak	86	26	56.0	0.00	
Sodaville	87	27	55.0	0.20	2.0
Tecoma *1	75	28	41.8	T.	T.
Toano	...	...	...	0.50	5.0
Tuscarora	75	19	40.7	0.62	T.
Tybo	76	...	...	0.60	6.0
Verdi *1	84	28	51.5	0.50	5.0
Wadsworth *1	78	28	47.0	0.10	1.0
Wells	72	14	42.2	1.16	1.0
New Hampshire.					
Alstead *6	76	17	43.3	1.44	1.8
Berlin Mills	86	2	39.6	0.54	3.5
Bethlehem	82	13	41.6	0.98	4.5
Brookline *1	85	20	43.6	2.03	10.0
Claremont	89	14	45.0	1.26	2.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Hampshire—Cont'd	°	°	°	*Ins.*	*Ins.*
Concord	86	14	43.0	1.19	2.2
Durham	86	24	44.0	1.38	T.
Grafton	85	7	38.8	1.25	5.0
Hanover	85	13	42.0	0.90	.....
Keene	84	15	43.3	1.14	T.
Littleton	83	14	42.8	0.86	4.0
Nashua	86	20	45.6	2.02	3.0
Newton	83	20	44.1	1.90	T.
North Conway	92	15	43.5	0.75	6.0
Peterboro	86	10	41.4	2.06	0.5
Plymouth	88	10	41.7	1.77	4.8
Sanbornton	85	18	42.1	1.54	5.0
Stratford	82	5	40.5	0.65	T.
Warner	.....	.....	.....	2.27	5.5
New Jersey.					
Asbury Park	74	26	47.1	1.36	T.
Barnegat	70	27	47.8	1.19	T.
Bayonne	83	27	50.0	1.51	T.
Belvidere	83	21	49.0	1.96	T.
Bergen Point	80	30	50.3	1.88	T.
Beverly	86	26	52.4	1.48	T.
Billingsport *[1]	79	29	50.1	1.60	
Boonton	80	22	49.1	2.59	
Bridgeton	85	26	53.0	1.93	
Camden	82	27	52.4	1.37	T.
Cape May C. H.	81	27	50.5	1.76	T.
Charlotteburg	80	18	46.7	3.25	
Chester	79	29	47.3	2.61	T.
Clayton	83	24	51.7	1.80	
College Farm	83	25	49.8	1.50	
Deckertown	81	22	49.4	1.45	T.
Dover	82	19	48.0	2.40	
Egg Harbor City	81	25	49.6	1.88	T.
Elizabeth	84	27	50.8	1.75	
Englewood	80	23	48.2	2.25	
Flemington	81	25	50.0	1.69	T.
Freehold	81	26	49.2	1.62	
Friesburg	81	27	51.4	1.55	
Hammonton	.....	.....	.....	1.36	T.
Hanover	79	25	49.6	2.21	
Hightstown	88	28	51.8	1.50	
Imlaystown	84	27	53.0	1.59	
Lebanon	.....	.....	.....	2.23	T.
Moorestown	82	26	51.0	1.61	T.
Mount Pleasant	.....	.....	.....	1.92	
Newark	81	26	48.8	1.73	T.
New Brunswick	84	26	51.9	1.58	T.
Newton	80	24	49.3	0.96	
Ocean City	77	26	47.6	2.27	
Oceanic	75	30	48.0	1.70	
Paterson	85	27	51.6	2.45	T.
Perth Amboy	84	27	49.2	1.45	
Plainfield	81	24	48.7	1.63	T.
Port Norris	82	28	52.4	1.52	
Rancocas	.....	.....	.....	1.49	T.
Rivervale	80	19	47.2	2.23	
Roseland	81	22	47.8	2.44	T.
Salem	84	26	53.1	1.28	
Somerville	83	23	50.7	1.94	
South Orange	80	27	49.0	1.88	T.
Toms River	80	25[d]	50.6[d]	0.48	T.
Trenton	80	26	51.8	1.67	
Vineland	86	26	51.8	1.38	
Woodbine	81	25	50.0	1.73	
New Mexico.					
Albert	87	30	59.6	0.00	
Albuquerque	78	30	56.8	0.34	0.4
Alma	85	26	55.4	0.31	
Aztec	76	18	50.6	0.07	0.7
Bernalillo	83	30	57.2	0.10	
Bluewater	78	15	48.2	T.	T.
Cambray *[1]	85	42	61.6	0.27	
Clayton	82	25	53.6	0.00	
Deming *[1]	84	41	58.0	0.00	
East Lasvegas	78	15	52.0	0.21	0.8
Engle	82	27	56.6	0.00	
Espanola	78	21	51.8	0.02	
Folsom	78	21	49.0	0.24	2.5
Fort Bayard	80	29	53.6	0.23	
Fort Union	76	16	47.0	0.17	1.0
Fort Wingate	75	20	49.6	0.10	T.
Gage *[1]	82	44	60.2	0.12	
Galisteo	83	23	52.5	0.93	
Gallinas Spring	85	25	54.6	0.40	
Gila	84	30	59.6	0.18	
Hillsboro	76	26	52.4	0.00	
Las Vegas Hotsprings	78	13	50.7	0.32	2.5
Lordsburg *[1]	83	46	66.0	0.04	
Los Lunas	81	30	56.2	1.35	
Lower Penasco [c]	81	27	51.6	T.	
Mesilla Park	87	25	56.7	0.13	
Monero	73	13	43.9	0.11	
Olio	85	28	53.4	T.	T.
Puerto de Luna	89	28	57.9	0.22	
Raton	77	19	49.8	0.05	0.5
Rincon	89	28	58.4	0.27	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Roswell	91	25	59.4	0.23	
San Marcial	88	27	58.6	T.	
Socorro	85	29[b]	55.3[f]	1.32	
Springer	84	22	53.5	0.00	
Strauss *[1]	86	46	64.4	0.27	
White Oaks	75	28	53.0	0.05	0.5
Winsors Ranch	67	10	41.6	0.15	
New York.					
Adams	.....	.....	.....	1.26	.....
Addison	85	21	49.2	1.17	T.
Akron	.....	.....	.....	1.27	.....
Alfred	83	15	46.6	0.71	0.5
Angelica	84	18	47.6	0.90	T.
Appleton	84	23	45.8	1.36	1 1
Arcade	84	15	46.6	1.04	3.3
Atlanta	.....	.....	.....	1.51	.....
Auburn	87	20	49.8	1.70	
Avon	87	18	47.6	1.39	T.
Baldwinsville	84[e]	22[e]	48.2[e]	1.90	3.0
Bedford	81	22	47.4	2.01	
Big Sandy *[10]	74	20	40.9	.....	.....
Bolivar	86	14	46.2	1.09	1.5
Bouckville	83	14	44.6	2.20	5.0
Boyds Corners	.....	.....	.....	1.99	.....
Brentwood	80	23	45.0	2.20	
Caldwell	77	15	44.2	1.38	3.0
Canajoharie	83	16	44.5	1.10	
Canton	84	18	45.6	2.40	1.5
Carmel	81	24	48.3	1.66	T.
Carvers Falls	84	13	43.9	0.96	
Catskill	79	23	48.5	2.26	T.
Cedarhill	84	22	48.8	1.11	T.
Charlotte *[10]	78	31	47.4	.....	.....
Chenango Forks	.....	.....	.....	0.80	.....
Cherry Creek	.....	.....	.....	1.96	.....
Cooperstown	82	15	44.0	1.87	2.0
Cortland	85	17	46.8	0.56	T.
Cutchogue	80	28	47.4	2.57	
Dekalb Junction	.....	.....	.....	1.62	.....
Dryden	89	12	46.4	1.94	
Elizabethtown *[1]	85	31	45.0	.....	.....
Ellenburg Depot *[1]	86	20	44.5	1.30	1.5
Elmira	85	22	50.7	1.52	
Fleming	84	19	48.5	1.04	T.
Fort Niagara	80	25	43.8	1.13	
Franklinville	85	13	46.4	1.12	2.8
Fulton	.....	.....	.....	1.79	.....
Garrattsville	83	21	46.1	0.40	
Glens Falls	82	23	46.9	1.44	T.
Gloversville	84	13	44.4	1.38	5.0
Greenwich	81	16	44.4	1.31	T.
Haskinsville	.....	.....	.....	0.40	.....
Hemlock Lake	81	23	47.2	1.15	T.
Honeymead Brook	82	20	47.3	0.51	
Hopewell	86	21	47.2	1.12	T.
Humphrey	84	18	48.2	1.24	8.1
Ithaca	87	20	48.7	1.45	2 2
Jamestown	86	20	48.9	2.33	10.5
Keene Valley	83	13	43.3	0.83	0.2
Kings Station	.....	.....	.....	2.00	.....
Lake Hill	81	19	45.6	1.76	1.6
Lake Placid	80	7	42.2	0.35	0.5
Little Falls	86	15	44.0	1.24	2.0
Lockport	87	21	48.6	0.48	T.
Lowville	84	12	43.8	2.01	3.0
Lyndonville	.....	.....	.....	0.39	.....
Lyons	84	26	49.0	1.46	T.
Madison Barracks	.....	16	.....	0.80	
Middletown	79	25	47.8	1.46	T.
Milford	.....	.....	.....	0.18	.....
Mohonk Lake[1]	74*	22	46.4	1.57	
Mount Morris	88	20	51.6	.....	.....
Newark Valley	.....	.....	.....	1.39	.....
New Lisbon	84	12	43.7	2.04	3.5
North Germantown	84	25	50.0	1.72	T.
North Hammond	76	22	47.2	1.13	0.5
North Lake	77	4	38.4	2.94	7.0
Number Four	82	8	41.2	2.15	4.8
Nunda	89	19	48.4	2.35	3.5
Ogdensburg	76	20	45.4	1.31	
Oneonta	87	13	46.4	0.81	
Oxford	87	16	46.6	1.70	1.0
Palermo	83	17	46.3	1.32	.....
Penn Yan	88	20	49.6	1.27	0.7
Perry City	88	14	46.0	1.46	3.6
Phenix	.....	.....	.....	2.09	.....
Pine City	.....	.....	.....	2.38	.....
Plattsburg Barracks	73	20	42.4	1.00	T.
Port Jervis	84	21	48.8	2.23	
Poughkeepsie	83	19	48.3	0.20	T.
Primrose	80	23	47.1	2.79	
Red Hook *[1]	82	26	48.8	.....	
Richmondville	86	14	44.2	1.62	0.5
Ridgeway	84	23	47.4	1.25	2.6
Rome	77	18	46.0	1.61	
Romulus	85	23	48.7	0.59	0.8

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rose	.....	.....	.....	2.09	.....
St. Johnsville	86	18	45.8	1.45	0.4
Saranac Lake	84	5	42.6	0.56	3.0
Schenectady	86	23	48.8	1.51	
Setauket	75	28	47.4	1.54	T.
Sherwood	.....	.....	.....	1.11	.....
Skaneateles	.....	.....	.....	1.82	.....
South Canisteo	86	17	46.7	1.51	4.9
Southeast Reservoir	.....	.....	.....	1.58	.....
South Kortright	84	12	43.5	1.79	T.
Straits Corners	83	16	47.0	1.29	1.5
Ticonderoga	85	17	46.4	1.98	
Victor	89[c]	20[c]	46.8[c]	2.19	7.7
Wappingers Falls	84	22	49.6	1.68	T.
Warwick	.....	.....	.....	1.37	.....
Watertown	86	15	46.9	2.76	3.0
Waverly	88	18	48.8	1.23	T.
Wedgwood	83	17	47.6	1.03	1.0
West Berne	76	20	42.0	2.89	6.0
Westfield *a*	88	20	47.6	1.01	3.9
Westfield *b*	89	20	48.6	0.82	.....
Westpoint	79	29	49.0	1.70	
Willetspoint	80	28	48.4	1.97	
Williamson	.....	.....	.....	1.99	.....
North Carolina.					
Abshers	86	21	54.0	3.95	T.
Asheville	.....	.....	.....	2.86	T.
Biltmore	86	27	53.5	2.80	T.
Bryson City	.....	.....	.....	2.47	
Chapel Hill	86	29	56.7	3.68	1.0
Currituck Inlet	.....	.....	.....	1.80	
Durham	83	31	59.3	2.90	6.0
Edenton	85	30	56.7	3.85	T.
Experimental Farm	84	32	56.8	3.79	6.0
Fairbluff	.....	.....	.....	4.22	
Fayetteville	89	30	58.6	3.40	T.
Flatrock	80	25	52.4	5.40	T.
Greensboro	85	31	56.6	2.57	T.
Henderson	86	29	55.8	2.20	0.5
Hendersonville	83	26	52.1	4.21	T.
Horse Cove	78	25	52.3	5.97	1.0
Lenoir *[1]	80	31	55.0	4.19	T.
Linville	73[d]	18[d]	46.8[d]	2.45	7.0
Littleton	85	27	54.6	2.98	3.5
Louisburg	86	28	56.9	4.04	5.0
Lumberton	85	33	58.6	4.59	T.
Mana	.....	.....	.....	2.30	4.0
Marion	88	28	55.7	4.33	1.5
Marshall	85	27	54.8	2.42	0.5
Mocksville	87	28	57.8	3.12	T.
Moncure	87	30	57.6	2.46	T.
Monroe	84	26	56.0	2.21	T.
Morganton	88	27	56.9	4.60	
Mountairy	82	26	54.0	3.42	3.0
Mount Pleasant	84	30	57.2	2.18	T.
Murphy	.....	.....	.....	3.81	
Newbern [c]	88	33	60.4	2.97	
Oakridge	86	28	56.0	2.55	1.5
Pantego	.....	.....	.....	3.84	T.
Patterson *[1]	85	28	50.8	5.12	1.0
Pittsboro	87	27	56.2	3.55	3.0
Rockingham	87	30	58.4	3.51	
Roxboro	84	23	54.0	1.88	2.5
Salem	86	28	56.4	2.25	1.0
Salisbury	88	32	58.8	4.57	
Saxon	88	26	56.2	2.18	3.0
Selma	88	27	56.6	3.80	6.0
Settle	86	26	54.2	2.25	2.0
Sloan	85	30	58.9	7.19	T.
Soapstone Mount	86	24	54.0	3.20	T.
Southern Pines *a*	88	32	60.4	3.97	T.
Southern Pines *b*	88	31	59.2	3.66	.....
Southport	79	30	58.8	8.92	
Springhope *[1]	82	28	55.6	2.70	5.0
Tarboro	88[d]	29[d]	58.4[d]	4.42	3.0
Waynesville	81	24	51.3	3.00	2.2
Weldon *a*	85	30	55.2	2.97	T.
Weldon *b*	.....	.....	.....	2.95	T.
North Dakota.					
Ashley	79	−6	39.4	0.97	0.5
Berlin	83	−18	39.6	1.30	2.0
Bottineau	64	−11	32.6	1.15	3.0
Buxton	80	−8	38.6	2.17	.....
Churches Ferry	75	−16	36.6	3.29	16.0
Coal Harbor	76	−4	37.6	1.88	12.0
Devils Lake	75	−15	35.4	1.76	16.1
Dickinson	74	−3	37.6	1.83	1.2
Donnybrook	78	−17	39.5	0.97	.....
Dunseith	71	−3	36.2	1.40	4.0
Ellendale	82	−6	42.4	1.21	T.
Fargo	81	−10	41.1	1.39	2.2
Forman	84	−5	41.8	0.54	1.0
Fort Berthold	73	−5	40.3	1.20	8.0
Fort Yates	81	1	40.2	0.71	2.1
Fullerton[1]	82*	−15	38.5	1.19	0.5
Gallatin	81	−15	38.4	1.34	6.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
North Dakota—Cont'd.					
Glenullin	74	2	35.4	0.57	1.0
Grafton	71	−8	37.5	2.14	8.0
Hamilton	81	3	38.4	2.40	13.1
Jamestown	75	−8	37.7	0.85	1.0
Kelso	82	−13	40.8	1.84	5.5
Langdon	75	−10	33.6	......	......
Larimore	81	−10	35.3	1.03	......
Lisbon	83	−5	39.9	1.26	......
McKinney	85	−22	35.5	0.61	3.0
Medora	86	−1	42.6	1.33	5.8
Melville	74	−10	37.0	1.21	9.5
Milton	78	−8	33.6	3.00	18.0
Minnewaukon	73	−16	36.0	......	......
Minot	70	−11	38.7	......	......
Napoleon	78	−8	39.6	0.80	3.2
New England City	71	−5	34.4	2.00	10.0
Oakdale	72	0	38.8	1.29	7.9
Pembina	82	3	39.5	1.64	......
Portal	71	−14	34.0	0.40	4.0
Power	80	−5	38.5	0.50	2.0
Sheyenne	78	−18	38.0	2.05	18.2
Steele	78	−5	40.2	0.57	3.2
Towner	70	−20	34.0	1.70	17.0
University	79			4.20	......
Valley City	81	−2	39.7	0.70	4.0
Wahpeton	......	−2	......	1.28	5.0
Washburn	80	−8	38.8	0.45	4.5
Willow City	73	−22	36.0	......	......
Woodbridge	76	−13	32.5	0.85	7.0
Ohio.					
Akron	87	19	52.0	1.69	0.7
Annapolis[d]	91	19	52.9	2.41	T.
Ashland	87	20	54.6	0.69	0.9
Ashtabula	87	21	48.0	1.25	0.5
Atwater	......	......	......	1.67	T.
Bangorville	88	17	51.6	1.01	T.
Bellefontaine	84	18	52.4	0.87	
Bement	......	16	......	1.58	3.5
Benton Ridge	89	20	52.4	1.48	
Bethany	90	22	55.2	0.82	
Bigprairie	88	22	53.9	2.17	0.5
Binola	......	......	......	1.93	0.8
Bladensburg	86	17	51.2	0.92	T.
Bloomingburg	87	20	54.8	1.47	T.
Bowling Green	88	17	51.8	1.21	0.2
Bucyrus	88	18	51.8	1.33	
Cambridge	87	18	51.2	1.36	
Camp Dennison	88	24	55.1	1.25	T.
Canal Dover	89	22	52.4	2.17	T.
Canton	87	20	50.8	4.45	0.4
Carrollton	88[d]	18[d]	51.8[d]	2.69	T.
Cedarville	......	......	......	1.43	
Celina	79	21	49.8	0.70	T.
Chillicothe	91	24	54.1	1.42	......
Circleville	88	23	55.2	1.69	
Clarksville	87	24	55.1	1.61	T.
Cleveland *a*	86	21	51.0	1.41	3.2
Cleveland *b*	88	22	50.8	1.31	......
Coalton	90	19	54.1	1.40	
Colebrook	87	11	49.8	0.64	T.
Dayton *a*	90	21	56.9	1.07	
Dayton *b*	......	......	......	0.99	T.
Defiance	89	15	51.2	2.49	T.
Delaware	90	21	53.6	0.99	T.
Demos	90	22	52.2	1.07	0.2
Dupont	84	20	53.5	0.95	T.
Elyria	90	18	52.8	1.45	0.1
Findlay	90	19	52.6	1.77	
Frankfort	89	20	54.2	1.10	
Garrettsville	87	11	50.2	1.30	0.5
Granville	88	21	53.1	2.44	T.
Gratiot	88	21	53.4	1.67	0.2
Greenfield	86[e]	25[e]	54.6[e]	1.20	
Greenhill	85	16	50.4	2.41	T.
Greenspring	91	22	57.6	1.01	T.
Greenville	85	22	52.9	1.16	T.
Hackney	......	......	......	1.09	T.
Hanging Rock	92	25	54.0	2.22	
Hillhouse	88	6	49.0	1.17	T.
Hillsboro	86	20	53.6	1.48	T.
Hiram	84	16	51.6	1.25	0.5
Hudson	84	13	51.0	1.24	T.
Jacksonboro	89	22	55.9	1.00	
Kenton	91	21	55.9	1.21	
Killbuck	84	20	51.4	1.35	1.0
Lancaster	89	22	54.0	1.53	T.
Leipsic	90	18	51.8	0.56	0.5
Levering	91	18	53.8	1.08	
Logan	94	19	54.4	1.49	
Lordstown	90	17	51.6	1.06	T.
Lowell	95	20	56.0	1.04	T.
McArthur	89	18	54.6	1.42	T.
McConnelsville	91	22	54.4	1.64	T.
Mansfield	......	......	......	1.75	4.0
Marietta	88	27	56.8	1.36	
Marion	86	21	53.8	1.45	T.
Ohio—Cont'd.					
Medina	86	16	52.4	1.88	T.
Milfordton	85	18	49.4	1.25	T.
Milligan	93	18	53.6	1.65	
Millport	84	16	50.5	3.35	T.
Montpelier	89	15	52.0	1.92	T.
Napoleon	90	15	51.2	1.56	
Neapolis	......	......	......	1.77	T.
New Alexandria	86	21	53.5	1.90	T.
New Berlin	87	17	52.0	2.13	T.
New Holland	89	22	55.0	1.27	T.
New Paris	88	18	54.8	1.07	T.
New Richmond	90	23	56.6	1.23	
New Waterford	89	17	51.8	1.61	T.
North Lewisburg	89	19	53.7	1.35	
North Royalton	88	14	51.3	1.87	T.
Norwalk	90	16	51.9	0.77	T.
Oberlin	89	20	52.7	1.35	T.
Ohio State University	87	21	53.5	1.21	
Orangeville	87	15	49.8	0.92	T.
Ottawa	90	19	53.5	1.45	T.
Pataskala	87	20	53.1	2.15	0.2
Perry	......	......	......	1.20	
Philo	92	20	55.0	0.96	T.
Plattsburg	85	18	53.9	1.53	T.
Pomeroy	92	25	55.3	1.15	T.
Portsmouth *a*	......	......	......	2.38	T.
Portsmouth *b*	94	27	59.2	2.38	T.
Pulse	......	......	......	1.83	
Richwood	93	20	56.4	0.99	T.
Ridgeville Corners	90	13	51.6	0.83	T.
Ripley	88	24	55.9	1.19	T.
Rittman	85	15	48.4	1.80	T.
Rockyridge	90	18	51.6	0.46	0.2
Rosewood	86	23	53.0	1.41	
Seaman	90	21	54.0	1.38	T.
Shenandoah	89	17	51.8	1.27	1.0
Sidney	90	20	53.8	1.35	T.
Sinking Spring	87	24	54.9	1.31	T.
Somerset	86	25	56.0	2.47	
Springboro	......	......	......	2.11	
Strongsville	......	......	......	3.11	
Sylvania	87	15	47.8	0.88	
Thurman	90	25	57.0	1.10	
Tiffin	88	20	52.0	2.64	T.
Upper Sandusky	89	19	54.3	1.14	
Urbana	86	20	52.7	1.07	T.
Vanceburg	90	23	56.2	2.12	T.
Vanwert	90	19	55.2	0.44	
Vermillion	87	18	50.9	1.06	0.5
Vickery	89	18	51.3	0.82	1.1
Walnut	......	......	......	1.60	T.
Warsaw	91	16	52.4	1.22	
Wauseon	91	15	53.0	1.19	0.3
Waverly	93	23	55.9	1.61	T.
Waynesville	87	21	53.6	1.32	
Wellington	89	18	52.4	1.44	T.
Westerville	86	23	53.5	1.11	T.
Willoughby	......	......	......	1.30	
Wooster	86	19	52.1	1.28	1.0
Zanesville	......	......	......	1.08	
Oklahoma.					
Arapaho	95	22	59.4	1.59	
Beaver	92	21	56.6	0.22	
Burnett	89	22	59.3	3.62	
Clifton	90	20	59.3	3.65	
Edmond	88	25	57.8	5.46	
Fort Reno	93	22	58.5	......	
Fort Sill	84	27	58.4	2.60	
Guthrie	90	25	59.2	5.46	
Hennessey	87[e]	23[e]	59.5[e]	2.95	
Hopeton	95	18	58.1	1.63	
Jefferson[i]	95	22	54.2	2.21	
Kingfisher	91	22	61.0	4.86	
Mangum	93	22	58.2	0.20	
Newkirk	91	23	58.5	2.90	
Norman	97	24	61.5	3.90	
Pawhuska	90	19	58.0	6.30	
Perry	92	21	58.7	3.23	
Prudence	96	25	58.0	2.40	
Stillwater	88	20	59.9	4.97	
Waukomis	93	19	59.3	1.88	
Winnview	92[d]	25[f]	61.0[e]	3.66	
Oregon.					
Albany *b*	......	......	......	2.98	
Arlington	75	29	51.6	0.27	
Ashland *b*	78	28	48.8	1.07	
Aurora *[1]	72	30	47.2	3.94	
Aurora (near)	74	28	47.7	5.22	
Bandon	64	36	49.3	5.01	
Bay City	65	31	47.4	14.99	
Beulah	73	19	44.3	0.69	T.
Blalock	77	33	54.8	0.52	
Brownsville *[1]	72	37	48.0	3.07	
Bullrun	68	32[d]	45.7	......	......
Burns	71	20	40.8	0.57	1.0
Burns (near)	78	22	45.8	0.02	0.2
Oregon—Cont'd.					
Cascade Locks	72	32	50.0	11.65	
Comstock *[1]	80	40	50.4	3.56	
Coquille River	......	......	......	4.34	
Corvallis	75	28	48.0	3.64	
Dayville	84	28	48.6	1.52	0.5
Ella	......	......	......	0.33	
Eugene	76	31	48.8	2.78	
Fairview	73	31	49.1	6.22	
Falls City	71	29	47.7	9.13	
Forestgrove	74	29	47.2	4.47	
Gardiner	67	34	50.0	7.65	
Glenora	76	28	47.0	16.81	0.2
Government Camp	60	14	36.2	12.70	85.0
Grants Pass	81	30	50.6	0.82	
Happy Valley	76	18	41.9	1.62	8.4
Heppner	72	25	47.0	1.27	T.
Hood River (near)	71	29	47.4	3.89	
Jacksonville	77	30	49.0	1.29	
Joseph	66	20	38.8	2.16	18.9
Junction City *[1]	78	38	49.6	3.06	
Kerby	83	26	50.2	1.58	
Klamath Falls	79	22	46.2	0.25	2.5
Lafayette *[1]	75	32	47.7	3.90	
Lagrande	78	27	45.2	2.37	T.
Lakeview	74	18	42.0	1.18	11.8
Langlois	70	34	50.2	7.30	
Lonerock	76	18	41.0	1.31	T.
Lorella	......	17	......	0.11	T.
McMinnville	73	29	47.8	5.00	
Merlin *[1]	78	32	49.0	0.33	
Monmouth *a* *[1]	77	35	49.6	4.00	
Monmouth *b*	74	29	48.0	4.61	
Monroe	76	28	48.5	3.95	T.
Mount Angel	78[e]	30[e]	48.4[e]	4.90	
Nehalem	......	......	......	15.55	
Newberg	74	27	47.2	4.81	
Newbridge	78	21	47.0	1.29	
Newport	63	29	47.7	8.61	
Pendleton	79	27	51.0	1.62	
Placer	......	......	......	1.51	
Prineville	63	16	40.0	1.44	T.
Riddles *[1]	84	30	48.9	1.68	
Riverside	81	18	44.6	0.82	
Salem *b*	75	28	48.2	3.72	
Sheridan *[1]	76	37	49.1	4.02	
Silver Lake	76	12	42.4	1.02	8.5
Silverton *[1]	76	40	50.8	4.67	
Siskiyou *[1]	78	30	48.4	0.40	4.0
Sparta	63	21	39.2	2.20	5.0
Springfield *[1]	75	38	48.8	2.21	
Stafford	74	29	47.4	5.65	
The Dalles	74	31	51.4	1.05	
Tillamook Rock	......	......	......	5.99	
Toledo	70	29	48.6	9.85	
Umatilla	......	......	......	0.40	
Vale	79	20	46.8	0.52	
Vernonia	86	28	46.8	5.78	4.0
West Fork *[1]	82	33	49.8	0.56	
Weston	75	26	46.0	2.78	T.
Williams	82	27	48.8	0.93	
Pennsylvania.					
Altoona	90	20	50.8	1.64	......
Aqueduct	86	26	52.6	1.14	T.
Athens	87	19	49.2	1.41	T.
Beaver Dam	......	......	......	1.74	
Bethlehem	......	......	......	1.70	......
Brookville	......	......	......	1.96	0.3
Browers Lock	......	......	......	1.60	......
Butler	88	16	50.6	1.36	0.4
Cameron	......	......	......	1.86	
Carlisle	84	23	52.6	1.14	
Cassandra	86	19	49.0	1.93	7.5
Cedarrun	......	......	......	0.50	
Centerhall	83	20	50.6	0.88	1.0
Chambersburg	83	......	......	1.23	
Coatesville	83	22	51.8	1.89	
Confluence	87	19	49.6	2.41	
Coopersburg	77	24	50.4	1.85	
Davis Island Dam	......	......	......	2.55	T.
Derry Station	92	21	53.5	2.55	T.
Driftwood	......	......	......	1.02	
Duncannon	......	......	......	1.07	T.
Dushore	84	15	45.7	1.82	2.0
East Bloomsburg	......	......	......	1.09	T.
East Mauch Chunk	83	20	49.7	2.35	T.
Easton	80	25	50.4	1.92	0.5
Ellwood Junction	......	......	......	1.83	
Emporium	89	18	49.4	2.57	T.
Everett	86[c]	19[c]	49.0[c]	1.37	1.0
Farrandsville	......	......	......	1.38	
Forks of Neshaminy *[1]	78	34	51.0	1.72	
Franklin	89	6	49.8	1.06	T.
Frederick	......	......	......	1.47	......
Freeport	......	......	......	1.77	T.
Girardville	......	......	......	2.02	4.5
Grampian	90	16	49.8	1.67	3.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Greensboro	90	20	53.8	1.14	T.
Hamburg	83	23	52.4	2.27	
Hawley	82	14	46.0	1.67	T.
Hawthorn	89	16	51.5	3.25	T.
Hews Island Dam				2.41	
Huntingdon *a*	91	19	51.6	1.32	0.5
Huntingdon *b*				1.07	
Irwin				2.81	T.
Johnstown	91	23	53.2	2.27	2.0
Karthaus				1.47	
Keating				1.25	T.
Kennett Square	82	24	51.3	2.23	
Lansdale				1.28	
Lawrenceville	76	18	47.2	2.10	T.
Lebanon	82	21	51.4	1.51	
Leroy	85	18	48.6	2.15	0.7
Lewisburg	83	22	51.0	1.89	
Lock Haven *a*	91	21	53.2	1.10	T.
Lock Haven *b*				1.06	
Lock No. 4				1.42	
Lycippus	85	19	51.9	2.03	0.2
Mifflin				1.70	
Nisbet				1.36	
Oil City				1.58	T.
Ottsville				1.86	
Parker				1.54	0.5
Philadelphia	81	29	53.6	1.43	T.
Quakertown	81	24	49.8	2.05	T.
Reading[2]			50.2	1.40	
Renovo *a*				1.60	
Renovo *b*	88	19	50.0	2.08	
Ridgway				1.74	1.5
Saegerstown	89	2	49.1	1.34	2.8
St. Marys		12		0.70	
Salem Corners	81	19	46.8	2.17	2.5
Scranton	86	22	49.4	1.96	
Selsholtzville				2.53	
Selinsgrove *a*	84	24	51.4	1.37	
Selinsgrove *b*				1.26	
Shawmont				1.32	
Shinglehouse	89	17	45.9	1.74	1.0
Sinnamahoning				1.17	T.
Smethport	86	14	47.1	1.40	T.
Smiths Corners				2.12	
Somerset	82	12	48.0	2.83	5.0
South Eaton	83	21	49.3	2.30	T.
State College	84	21	50.9	1.71	0.4
Sunbury				1.45	
Swarthmore	89	28	52.5	1.00	
Towanda	86	19	48.8	1.84	0.5
Trout Run				1.74	
Uniontown	86	25	52.8	1.37	
Warren	89	18	47.8	1.64	3.1
Wellsboro	85	18	47.6	3.07	T.
West Chester	80	25	51.8	2.02	
West Newton				1.47	
White Haven	90	18	46.2	1.28	T.
Wilkesbarre	87	23	50.6	1.37	
Williamsport	82	24	50.4	1.71	T.
York	84	22	51.4	1.28	0.4
Rhode Island.					
Bristol	70	28	46.0	2.00	0.5
Kingston	74	22	44.9	2.63	0.5
Lonsdale				2.02	T.
Pawtucket	78	29	50.3	1.88	T.
Providence *a*	79	28	50.0	2.12	T.
Providence *c*	80	26	47.3	2.18	T.
South Carolina.					
Allendale	85	32	62.2	2.21	
Anderson				2.33	
Batesburg	86	33	60.8	2.80	
Beaufort	85	38	64.0	2.62	
Blackville	86	33	61.3	2.36	
Calhoun Falls				1.07	
Camden				2.76	
Central	84	27	58.2	3.28	
Cheraw *a*	89	32	59.4	2.29	
Cheraw *b*				2.76	
Clemson College	83	29	58.2	2.70	
Conway				5.52	
Darlington				3.43	
Edisto				3.38	
Effingham				2.88	
Florence	86	31	60.0	4.06	
Gaffney				2.82	
Georgetown	87	34	62.6	4.25	
Gillisonville	88	32	62.2	2.31	
Greenville	82	28	55.8	4.63	
Greenwood	85	30	59.2	1.64	
Holland	88	28	57.8	2.78	
Kingstree *a*	85	33	61.0	3.40	
Kingstree *b*				3.47	
Little Mountain	88	30	60.0	1.34	
Longshore	86	29	59.0	1.42	
Pinopolis *[1]	81	36	59.9	2.91	
St. Georges	85	35	61.4	3.88	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. Matthews	91	33	60.8	3.04	
St. Stephens				3.86	
Santuck	85	28	58.4	1.40	T.
Shaws Fork	86	30	59.0	1.88	
Smiths Mills				5.57	
Society Hill	85	33	59.8	2.62	
Spartanburg	86	31	57.3	3.45	T.
Statesburg	87	32	61.2	2.89	
Summerville	86	34	60.4	4.51	
Temperance	88	30	59.1	4.56	
Trenton	84	34	61.9	1.53	
Trial	85	30	58.0	4.30	
Walhalla	86	28	57.0	3.37	
Winnsboro	79	30	56.6	1.32	
Yemassee	87	36	62.0	2.07	
Yorkville	87	33	60.0	2.62	T.
South Dakota.					
Aberdeen	86	0	44.3	1.41	
Alexandria	87	8	47.3	1.56	3.0
Armour	88	1	47.0	1.00	2.0
Ashcroft	80	−12	41.0	1.28	7.5
Brookings	84	5	43.8	3.36	8.0
Canton	84			1.17	4.5
Centerville				0.91	4.0
Chandler	86	6	46.6	1.12	0.5
Clark				1.16	1.0
Desmet	84	11	44.4	2.17	6.0
Doland	89	2	44.2	2.06	1.9
Elkpoint	85	13	49.0	1.47	1.2
Farmingdale				0.34	T.
Flandreau	88	6	46.0	1.55	4.0
Forestburg	88	4	44.2	1.79	6.5
Forest City	88	0	44.4	0.45	3.0
Fort Meade		1		4.15	1.5
Gann Valley				2.00	5.0
Gary		4		3.20	
Goudyville	84	− 4	41.2	2.41	5.0
Hotch City	85	− 1	46.5	1.53	1.5
Hot Springs	82	− 4	43.1	0.20	T.
Howard	85	15	48.5	1.74	3.0
Interior	82	− 4	41.7	2.50	T.
Ipswich	85	0	42.4	1.22	
Kimball	87	4	45.6	1.32	3.0
Leslie	87	− 3	44.2	0.65	T.
Mellette	86	− 1	43.3	1.19	0.5
Menno	88	7	46.6	1.07	2.0
Millbank	84	5	44.2	1.59	
Mitchell	87	6	44.2	2.13	3.5
Montrose	86	6	43.8	1.85	3.5
Nowlin	89	2	45.6	1.22	2.0
Oelrichs	83	10	44.8	1.20	2.0
Parker	86	9	45.8	1.41	4.5
Plankinton	90	9	45.8	2.31	5.5
Redfield	86	2	42.9	1.85	3.0
Rochford	76	− 5	37.8	1.36	8.5
Rosebud	84	0	44.6	1.31	2.0
Silver City				0.85	1.0
Sioux Falls	84	5	44.4	2.64	4.0
Spearfish	77	1	41.2	1.96	10.0
Tyndall	86	10	46.4	0.60	1.5
Watertown	82	2	42.8	2.02	
Waubay	80	− 1	42.9	0.82	3.0
Wentworth	84	6	44.2	2.66	
Wessington Springs	80	1	41.6	2.42	7.0
Whiteswan	86	11	48.6	1.35	0.8
Wolsey				1.12	T.
Tennessee.					
Andersonville	89	26	56.5	4.43	T.
Ashwood	88	30	58.0	3.52	
Benton (near)	91	27	59.6	3.63	
Bluff City				2.70	T.
Bristol	85	25	54.0	2.37	T.
Byrdstown	88	25	57.9	6.10	0.6
Carthage	89	28	59.2	3.64	
Charleston				4.48	
Clarksville	88	28	58.5	4.24	
Clinton				4.71	
Decatur	88	26	58.5	4.48	
Dover	97	26	59.9	3.28	T.
Elizabethton	90	25	52.3	2.08	T.
Elk Valley		23		3.52	
Erasmus	86	17	53.0	5.92	T.
Florence	86	27	59.4	4.98	T.
Franklin	85	29	58.4	3.99	
Grace *[1]	94	28	57.0	4.10	
Greeneville	88	24	54.8	2.83	T.
Harriman	88	26	57.4	4.28	
Hohenwald	86[b]	26	60.2[d]	3.64	
Jackson	87[e]	30[e]	60.0[e]	3.10	
Johnsonville	92	29	59.2	2.90	
Jonesboro *[1]	84	33	55.2	1.52	T.
Kingston				3.97	
Lafayette *[5]	90	26	56.9	4.77	T.
Lewisburg *[1]	87	32	57.8	4.67	T.
Liberty	89	27	58.4	3.09	
Lynnville	91*	29	53.6	4.94	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
McKenzie	88	27	59.6	3.18	
Madison	90	27	58.4	3.94	
Maryville *[5]	89	27	58.6	2.96	T.
Newport	86	27	56.9	2.31	T.
Nunnelly	90	25	58.8	3.36	
Oak Hill	89	22	56.7	6.72	T.
Palmetto	88	28	59.2	3.61	
Peryear *[5]	91	27	59.8	3.05	
Pope	90	23	57.9	3.30	
Rogersville	86	27	55.9	2.46	T.
Rugby	86	20	54.4	3.33	1.0
Savannah	88	30	59.2	3.17	T.
Sewanee	84	27	55.8	4.15	T.
Silverlake	83	24	50.7	2.58	T.
Springdale	92	23	56.2	3.33	T.
Springfield	87	27	58.0	3.75	T.
Tazewell				3.20	T.
Tellico Plains	89	26	56.0	2.71	T.
Tracy City	85	24	55.2	5.42	T.
Trenton	90	30	60.2	2.57	T.
Tullahoma	86	24	57.8	6.20	T.
Union City	87	27	57.8	1.55	T.
Waynesboro	88	26	57.6	2.80	
Wildersville	87	29	59.1	5.25	
Yukon	87	29	59.4	2.41	
Texas.					
Albany *[1]	88	30	62.8	4.38	
Alvin				1.56	
Anna	89	30	62.0	2.32	
Anson				2.51	
Arthur				6.31	
Austin *a*	92	36	66.0	2.40	
Austin *b* *[5]	92	34	63.5		
Ballinger	94	27	64.0	2.65	
Beaumont	88				
Beeville	99	38	68.8	3.65	
Blanco	92	34	62.8	2.50	
Boerne *[1]	92	33	66.3	1.77	
Brazoria	81	39	66.3	4.42	
Breckenridge[4]	94	31	63.2	3.44	
Brenham	87	38	66.4	2.31	
Brighton	85	40	69.9	3.76	
Brownwood	90	30	60.0	3.70	
Burnet *[1]	86	33	64.7	2.31	
Camp Eagle Pass	100	35	72.1	0.00	
Coleman	90	30	62.4	2.50	
College Station	83	37	64.4	2.75	
Colorado				1.58	
Columbia	84	38	66.2	2.09	
Conroe	88	38	65.8	4.24	
Corsicana	95	32	64.4	1.70	
Cuero	90	37	66.6	5.05	
Dallas	91	31	62.0	4.80	
Danevang	88	36	67.6	3.36	
Dublin	91	30	61.7	2.21	
Duval	96	38	69.8	3.19	
Emory	90	32	63.2	3.08	
Estelle	93	30	64.5	2.99	
Fort Brown	92	46	72.2	1.61	
Fort McIntosh	106	39	78.5	3.72	
Fort Ringgold	108	37	74.0	1.07	
Fort Stockton				2.16	
Fredericksburg *[1]	91[c]	32[c]	65.1[c]	2.84	
Fruitland	93	27	61.3	3.50	
Gainesville	89[c]	29[c]	61.4[c]	2.33	
Georgetown *[1]	93	35	67.8[c]	1.84	
Golindo				0.60	
Grapevine	91	29	62.9	3.09	
Hale Center	88	28	60.3	0.25	1.5
Hallettsville	88	39	67.8	3.82	
Hewitt				1.60	
Hondo				1.65	
Honeygrove				3.69	
Houston	84	42	65.8	4.57	
Hulen	84	39	66.4	1.69	
Huntsville	87	38	64.6	2.23	
Jacksonville	91	37	65.0	2.81	
Jasper	90	37	64.4	4.17	
Kent				1.95	
Kerrville	96	27	64.6	2.99	
Lampasas	92	31	65.4	3.33	
Llano *[5]	90	36	67.4	3.36	
Longview	93	37	63.8	5.69	
Luling	91	37	67.4	3.22	
Marathon	93	24	61.3	1.75	
Marshall	87	35	63.5	3.24	
Mount Blanco	94	17	57.6	0.04	
New Braunfels	92	38	68.5	2.20	
Panter				1.89	
Paris *a*	87	32	60.4	3.17	
Paris *b* *[1]	84	35	64.3		
Point Isabel *[1]	84	56	72.4	0.70	
Rhineland	94	24	62.4	1.33	
Rock Island				4.00	
Rockport *[1]	72	36	64.2		
Rocksprings				2.34	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Texas—Cont'd	°	°	°	*Ins.*	*Ins.*
Runge	97	38	70.6	6.96	
Sabine Pass	88	45	68.2	3.25	
San Antonio	97	38	69.6	2.73	
Sanderson	93	50	73.6	1.45	
San Marcos	90	37	64.0	1.94	
Sherman	87	32	61.1	3.39	
Sugarland	94	39	68.7	5.14	
Sulphur Springs	89	32	63.2	3.92	
Temple *a*	88	33	65.4	2.17	
Temple *b*	91	30	65.1	2.01	
Tyler	92	35	64.0	3.75	
Victoria	......	......	......	4.70	
Waco	93	35	65.4	2.10	
Waxahachie	90	30	64.2	2.10	
Weatherford	93	31	63.0	4.23	
Wichita Falls	......	......	......	3.14	
Utah.					
Brigham	......	......	......	0.82	
Castledale	77	20	48.2	T.	
Cisco	82	19	51.0	T.	T.
Corinne	79	16	46.3	0.12	1.2
Fillmore	80	22	50.0	1.45	
Fort Duchesne	77	18	46.8	0.60	6.0
Frisco	75	22	49.2	1.01	6.0
Giles [j]	84	21	52.8	0.78	
Grover	78	11	46.0	0.29	3.0
Heber	74	16	44.6	0.89	2.0
Huntsville	......	......	......	1.54	5.0
Kelton *[1]	75	35	51.4	0.00	
Levan	78	20	47.5	0.71	
Loa	73	13	42.2	0.65	6.5
Logan	74	22	47.2	0.86	
Manti	84	21	49.8	......	
Marysvale	......	......	......	1.19	7.0
Millville	......	......	......	1.15	
Minersville	78	24	49.0	0.71	4.0
Moab	90	26	56.8	0.37	
Mount Pleasant	80	19	47.4	0.57	4.0
Ogden *a* *[1]	80	27	49.7	0.53	3.0
Pahreah	82	26	53.2	T.	
Parowan	77	20	49.4	1.20	12.0
Pinto	76	15	47.0	0.40	T.
Promontory *[1]	78[d]	25[d]	45.4[d]	0.20	2.0
Provo	80	26	52.3	0.39	
Richfield	75	20	45.3	0.70	7.0
St. George	90	24	56.6	0.24	
Scipio	79	13	47.4	0.51	T.
Snowville	72	21	46.2	0.10	1.0
Soldier Summit	74	12	46.4	0.20	2.0
Thistle	......	......	......	0.05	T.
Tooele	80	27	49.5	0.58	
Tropic	77	15	45.4	0.34	T.
Vernal	76	24	47.3	0.39	1.0
Woodruff	68	18	38.8	0.12	1.0
Vermont.					
Bennington	84	16	46.2	1.55	
Brattleboro	83	14	45.1	1.48	
Burlington	75	22	45.4	1.88	1.5
Chelsea	82	14	40.2	1.16	8.0
Cornwall	82	19	46.4	1.15	
Derby	84	3	40.9	1.43	T.
Enosburg Falls	83	8	43.6	1.66	7.5
Hartland	83	10	40.0	1.51	4.2
Jacksonville	82	18	40.6	2.43	5.0
Norwich	85	11	41.3	1.27	2.0
St. Johnsbury	80	9	40.1	1.39	2.0
Vernon *[6]	76	24	46.6	1.67	
Wells	80	15	42.5	1.68	
Woodstock	82	12	39.2	1.22	2.0
Virginia.					
Alexandria	84	28	55.3	1.48	T.
Ashland	87	26	55.8	1.11	
Barbourville	85[e]	28[d]	57.9[d]	1.81	
Bedford City	87	28	56.4	......	
Bigstone Gap	86	24	54.8	2.01	T.
Birdsnest *[1]	87	34	54.2	2.00	
Blacksburg	82	23	50.3	2.52	4.5
Buckingham	84	24	48.8	1.94	T.
Burkes Garden	80	16	48.6	3.43	6.7
Callaville	85	26	54.7	2.46	0.5
Charlottesville	84	31	57.3	1.67	T.
Christiansburg	......	......	......	3.36	3.0
Clarksville	......	......	......	1.55	T.
Clifton Forge	78	23	51.4	......	1.0
Colemans Falls	80	29	54.6	1.70	......
Dale Enterprise	84	21	51.0	1.21	T.
Danville	......	......	......	2.48	......
Doswell	84	23	53.8	0.96	
Farmville	88	26	57.2	1.82	T.
Fredericksburg	85	29	55.8	1.50	
Grahams Forge	79[c]	24[c]	51.0[c]	2.92	3.0
Hampton	86	33	56.3	1.58	1.0
Hot Springs	78	19	49.4	1.90	
Lexington	84	25	52.9	1.25	1.0
Manassas	84	28	55.0	1.57	
Marion	84[g]	23[g]	51.2[g]	2.48	2.0

Stations	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Miller School	87	21	56.0	1.54	
Newport News	82	33	58.2	2.38	T.
Petersburg	86	26	57.5	1.73	T.
Quantico	82	30	54.8	......	
Radford	......	......	......	2.54	3.0
Richmond (near)	86	26	55.7	1.48	T.
Rockymount	84	30	56.2	2.10	1.5
Salem	85	31	56.4	2.59	3.0
Speers Ferry	......	......	......	3.02	
Spottsville	86	26	55.6	2.59	3.0
Stanardsville	84	27	54.8	1.47	
Staunton	86	26	54.3	1.66	T.
Stephens City	90	25	54.4	0.61	T.
Sunbeam	86	27	55.0	2.89	4.0
Tobaccoville	83	26	53.4	1.55	T.
Warrenton	78	30	55.2	2.53	
Warsaw	87	24	54.7	0.89	
Westbrook	83	28	55.4	......	
Westpoint	95	25	54.0	1.93	
Williamsburg	78	35	55.4	......	
Woodstock	87	25	53.6	1.17	T.
Wytheville	86	24	52.4	4.22	6.0
Washington.					
Aberdeen	72	28	47.2	9.47	
Anacortes	......	......	......	1.49	
Ashford	......	......	......	8.54	5.5
Blaine	76	21	43.5	3.22	T.
Bremerton	73	29	48.3	4.10	
Brinnon	70	32	47.0	4.28	
Cedar Lake	......	......	......	12.77	
Cedonia	64	18	39.6	1.80	2.4
Centerville	72	20	45.0	0.63	
Chehalis	75	30	47.9	5.25	
Cheney	......	......	......	0.28	
Clearwater	......	30	......	14.01	
Cle Elum	69	20	41.8	2.88	7.5
Colfax	75	26	47.7	2.44	T.
Connell	......	......	......	0.10	
Coupeville	67	29	45.8	1.68	
Crescent	......	......	......	1.30	
Dayton	76	27	47.6	1.63	
Ellensburg	72	21	46.0	0.10	
Ellensburg (near)	70	22	45.4	T.	T.
Fort Simcoe	78	28	49.4	0.25	T.
Grandmound	73	28	47.4	5.83	
Hooper	78	26	50.2	0.83	
Kennewick	79	28	53.7	0.38	
Lacenter	74	30	47.2	4.76	
Lakeside	70	28	48.5	0.41	
Lind	80	22	49.0	0.96	T.
Loomis	72	28	49.4	1.20	
Mayfield	74	28	48.7	7.48	
Montecristo	60	23	38.4	10.87	105.0
Moxee Valley	75	19	48.0	0.07	
New Whatcom	76	30	48.2	1.89	
Northbend	78	25	48.8	10.96	
Northport	......	......	......	1.31	
Olga	66	32	47.3	2.14	
Olympia	72	30	47.8	5.63	
Orcas Island	66	33	49.0	2.00	
Pinehill	71	28	48.0	1.98	
Pomeroy	70	33	49.6	1.34	T.
Port Townsend	67	34	47.6	1.45	
Pullman	72	27	43.4	2.55	
Ritzville	......	......	......	0.65	
Rosalia	70	25	43.9	3.08	0.3
Sedro	75	33	49.9	5.59	
Silvana	70	28	45.8	4.48	
Snohomish	71	31	48.2	6.11	
Snoqualmie	74	33	49.2	8.74	
Southbend	74	32	47.2	11.75	
Sprague	......	......	......	0.66	
Stampede	58	26	39.8	6.92	21.0
Sunnyside	75	22	50.8	0.12	T.
Union City	71	31	47.2	7.60	
Vancouver	74	31	49.0	3.75	
Vashon	69	32	47.2	4.25	
Waterville	70	23	43.8	0.10	1.0
West Virginia.					
Beverly	92	18	52.0	2.86	5.0
Bluefield	84	23	52.6	2.76	3.0
Buckhannon *a*	......	......	......	1.97	0.1
Buckhannon *b*	90	20	52.4	......	......
Burlington	90	21	52.4	......	......
Charleston	......	......	......	3.17	T.
Dayton	91	19	52.2	1.79	T.
Eastbank	91	26	57.6	1.26	T.
Elkhorn	87	26	53.7	2.88	1.4
Fairmont	......	......	......	2.27	
Glenville	88	23	53.8	2.72	T.
Grafton	88	22	53.2	1.84	T.
Green Sulphur	80	21	51.0	1.55	
Harpers Ferry	......	......	......	1.06	T.
Hinton *a*	......	......	......	2.07	1.0
Hinton *b*	88	26	54.4	......	1.5
Huntington	92	26	56.6	2.20	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Kingwood	88	20	52.4	1.51	
Marlinton	84	20	48.8	1.60	T.
Martinsburg	84	24	52.8	1.30	T.
Morgantown	93	20	53.8	1.94	T.
New Cumberland	91	20	54.6	2.30	T.
New Martinsville	91	24	55.8	1.75	T.
Nuttallburg	89	26	55.8	2.15	......
Oceana	90	24	55.0	2.20	
Oldfields	90	20	51.2	0.92	
Parsons	85	20	50.6	3.00	
Philippi	91	21	52.5	1.49	0.8
Point Pleasant	92	25	57.4	2.08	T.
Powellton	88	26	53.8	1.78	0.1
Romney	88	24	53.2	1.08	
Rowlesburg	......	......	......	2.31	
Upper Tract	93	19	52.7	0.94	T.
Weston *a*	......	......	......	1.69	0.8
Weston *b*	92	23	55.0	......	0.5
Wheeling *a*	......	......	......	2.06	0.3
Wheeling *b*	92	28	57.8	2.29	0.5
Wisconsin.					
Amherst	82	4	45.8	2.76	1.0
Antigo	82	9	47.4[d]	......	......
Barron	78	− 2	43.4	......	
Bayfield	69	7	40.1	2.20	
Beloit	84	18	50.9	2.65	T.
Brodhead	85	18	51.0	3.99	
Butternut	84	− 7	42.4	1.76	
Chilton	84	10	50.0	1.90	
Citypoint	84	9	49.0	1.63	T.
Delavan [d]	88	16	50.4	1.55	T.
Dodgeville	81	10	49.1	3.56	
Easton	85	9	47.4	2.46	
Eau Claire	84	11	46.5	1.58	
Florence	79	6	42.1	4.19	T.
Grand River Locks	......	......	......	2.36	
Grantsburg	82	−7	45.8	2.50	
Gratiot	82	3	47.6	1.91	
Hartford	86	7	49.6	1.61	
Hartland	83	11	48.8	2.44	T.
Harvey	86	14	49.8	2.97	0.2
Hayward	84	1	45.2	1.48	1.0
Heafford Junction	81	3	42.6	2.47	1.0
Hillsboro	81	8	47.6	2.94	
Knapp	81	9	44.8	1.60	
Koepenick *[1]	80	18	47.8	4.20	1.0
Lancaster	84	11	49.0	2.54	
Lincoln	81	15	46.2	2.32	
Madison	79	15	48.5	2.69	T.
Manitowoc	78	18	43.4	1.67	T.
Meadow Valley	83	7	47.4	4.01	T.
Medford	85	0	43.6	1.58	T.
Menasha	......	......	......	2.98	
Neillsville	88	8	46.6	2.18	T.
New Holstein	84	6	49.1	1.05	T.
New London	84	8	46.9	2.89	
Oconto	84	13	46.6	2.53	T.
Osceola	82	− 2	44.0	2.86	1.0
Oshkosh	86	5	51.2	3.50	
Pepin	84	12	48.0	1.05	T.
Pine River	85	12	48.2	2.79	T.
Portage	84	12	48.9	2.02	
Port Washington	82	10	46.4	1.68	
Prairie du Chien	85	14	50.3	1.78	T.
Prentice *[1]	80	10	42.8	2.57	
Racine	83	10	47.2	0.31	
Sharon	89[d]	17[d]	51.6[d]	0.62	
Shawano	85	2	45.6	2.55	T.
Spooner	89	7	46.8	1.94	
Stevens Point	82	1	47.0	3.86	
Sturgeon Bay Canal *[10]	71	14	41.1	......	......
Valley Junction	82	8	47.8	3.41	T.
Viroqua	80	13	47.8	3.70	0.2
Watertown	84	12	48.7	2.95	T.
Waukesha	88	13	48.8	1.19	T.
Waupaca	85	7	47.2	2.33	
Wausau	80	10	45.1	4.26	0.5
West Bend	86	14	49.7	1.86	
Westfield	83	11	47.6	1.55	
Whitehall	80	9	49.6	1.12	0.5
Wyoming.					
Alcova	80	1	42.0	......	......
Basin	81	8	46.0	0.13	
Big Piney	68	10	35.6	0.05	0.5
Burns	69	5	32.0	T.	T.
Carbon	92	11	44.6	0.40	6.0
Centennial	65	5	35.8	2.00	20.0
Cody	72	5	45.0	0.00	
Dome Lake	50	10	29.4	1.80	18.0
Embar	72	10	44.1	0.35	3.5
Evanston	68	10	37.2	1.83	15.0
Fort Laramie	83	12	46.4	0.91	T.
Fort Washakie	74	9	42.6	0.45	2.2
Fort Yellowstone	60	10	35.8	2.30	14.5
Four Bear	69	2	36.8	0.35	4.5
Hecla	72	8	40.8	1.72	9.8

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Laramie	65	12	38.3	1.75	17.5
Lovell	78	8	44.8	0.14	1.0
Lusk	81	12	44.0	0.25	......
Rawlins	69	19	41.4	1.16	6.3
Rocksprings	72	11	42.8	1.50	T.
Sheridan	75	−3	41.2	0.89	1.2
Sherman	......	......	......	1.40	14.0
Thayne	65	11	37.0	0.80	4.0
Wamsutter	......	......	......	0.00	
Wheatland	79	9	45.2	2.10	1.0
Mexico.					
Ciudad P. Diaz	95	42	72.4	0.93	
Coatzacoalcos [2]	......	......	78.8	......	
Leon de Aldamas	92	45	67.6	0.04	
Puebla	84	39	63.3	0.38	
Tampico [2]	......	......	73.4	......	
Topolabampo *[1]	86	65	73.3	0.00	
Vera Cruz [2]	......	......	77.6	......	
New Brunswick.					
St. John	54	24	39.4	1.05	
Porto Rico.					
Puerta de Tierra	91	68	77.6	4.81	
San German	89	53	70.6	12.94	

Late reports for March, 1899.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Coal Harbor	48	5	34.7	4.28	1.0
Juneau	44	10	29.2	1.58	21.0
Killisnoo	44	8	28.6	2.00	14.0
Kodiak	64	11	36.0	4.17	2.7
Skaguay	47	−1	23.4	0.13	1.0
Tyoonok	48	4	23.6	0.65	2.5
California.					
Anada	......	......	....	7.98	
Hill Ranch	91	32	55.9	2.47	
Kernville	......	......	......	2.10	
Georgia.					
Americus	90	18	59.2	4.98	
Fort Gaines	87	25	59.0	2.71	
Gainesville	73	11	49.5	10.46	T.
Quitman	87	22	61.1	4.00	
Rome	77	8	50.8	8.02	T.
Toccoa	78	9	50.6	9.14	
Waycross	83	24	61.0	1.10	
Idaho.					
Yellow Jacket	......	......	......	1.17	
Kansas.					
Fort Scott	75	0	38.7	2.10	3.0
Garfield	......	....	......	0.36	2.9
Hays	84	4	38.0	0.25	1.0
Maryland.					
Darlington	63	23	40.5	5.31	3.0
Massachusetts.	°	°	°	*Ins.*	*Ins.*
Leicester Hill	58	8	29.0	3.00	2.2
Nevada.					
Beowawe *[1]	70	15	37.6	1.85	6.5
Elko *[1]	60	10	33.4	2.60	10.5
Humboldt *[1]	53	23	38.6	0.57	
Lovelock *[1]	55	23	38.6	0.93	
Mills City *[1]	70	22	40.1	1.35	5.5
Reno *[1]	67	20	38.6	2.33	5.0
New Mexico.					
Alma	82	10	47.2	0.58	
Deming *[1]	84	28	50.4	0.00	
Gage *[1]	77	36	52.4	0.16	
Lordsburg *[1]	78	31	51.5	0.18	
Shattucks Ranch	80	22	52.2	0.35	T.
New York.					
Adams	.....	......	.....	4.61	
Akron	......	....	......	2.45	
Atlanta	.....	.....	......	2.45	
Cherry Creek	......	......	......	4.21	
Dekalb Junction	.....	......	......	5.46	
Eagle Mills	.....	......	......	3.82	
Easton	......	......	......	6.33	
Fayetteville	......	......	......	3.62	
Fulton	......	......	....	3.64	
Haskinville	.....	......	.....	1.74	
Kings Station	....	......	......	11.24	
Lyndonville	.....	......	......	2.13	
Napoli	.....	......	......	2.66	
Newark Valley	......	......	......	3.53	
Niagara Falls	......	.....	......	2.27	
Phenix	.....	......	......	5.08	
Pine City	.....	......	......	3.37	
Rose	......	......	......	1.90	
Sherwood	......	......	......	2.14	
Skaneateles	....	......	......	3.65	
Warwick	......	.....	.....	4.44	
Ohio.					
Chillicothe	74	9	42.0	6.62	3.0
South Dakota.					
Brookings	58	−17	15.6	0.40	4.0
Texas.					
Ballinger	95	21	56.9	0.01	
College Station [2]	86	30*	59.9	1.87	
Dallas	98	25	55.8	0.25	
Grapevine	97	21	56.3	0.71	
Temple *b*	98	21	58.9	0.12	
Utah.					
Bluecreek *[1]	60	14	37.4	1.70	3.0
Kelton *[1]	60[l]	23[d]	40.0[d]	0.50	T.
Ogden *a* *[1]	63	25	38.6	2.65	9.0
Promontory *[1]	63	22	38.3	0.30	3.0
Terrace *[1]	52	15	30.2	0.05	0.5

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[8] Mean of 7 a. m. + 2 p. m. + 9 p. m. ÷ 3.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

February, 1899, Colorado, Alexander Lakes, make precipitation 1.77 and snow 26.5.

March, 1899, California, Greenville, make precipitation 7.82 instead of 7.76.

March, 1899, Colorado, Troutvale, make minimum and mean temperatures read zero and 27.4, respectively, instead of −21 and 18.6.

March, 1899, Nebraska, Arborville, make mean temperature 25.9 instead of 29.8.

March, 1899, Wisconsin, Brodhead, make precipitation 1.41 instead of 1.57.

NOTE.—The following changes have been made in names of stations:

Missouri. Farmersville, changed to Hazelhurst.

North Dakota, Goetz, changed to Donnybrook.

TABLE III.—*Mean temperature for each hour of seventy-fifth meridian time, April, 1899.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midn't.	Mean.
Bismarck, N. Dak....	36.2	35.0	34.3	33.6	32.8	32.0	30.6	30.9	32.9	36.4	39.5	41.9	43.7	45.9	47.3	48.3	48.6	48.4	47.5	46.5	43.2	40.6	39.0	37.9	39.7
Boston, Mass	42.6	41.9	41.2	40.9	40.7	40.8	42.6	45.8	48.1	50.0	51.7	52.8	54.0	53.9	53.5	53.6	52.3	51.1	49.3	47.8	46.9	45.9	45.1	44.1	47.4
Buffalo, N. Y..........	44.8	44.0	43.6	42.7	42.5	42.0	42.6	43.8	45.3	46.5	48.2	49.7	50.8	52.4	52.6	52.2	52.0	51.5	50.0	49.1	48.2	47.8	47.2	46.7	47.3
Chicago, Ill...........	48.3	47.6	47.0	46.4	45.1	44.7	44.4	46.4	47.4	48.7	49.7	51.0	51.4	52.2	52.8	53.1	52.9	52.7	51.9	51.9	51.1	50.5	50.0	49.8	49.5
Cincinnati, Ohio....	53.0	52.2	51.1	50.5	49.7	49.3	48.8	50.8	52.5	55.0	57.1	59.2	60.8	61.9	63.2	63.9	63.8	63.3	62.0	60.3	59.1	58.0	56.6	55.3	56.6
Cleveland, Ohio	47.5	47.6	46.7	46.3	45.9	45.4	45.4	46.4	48.2	50.5	50.8	51.6	53.3	53.6	53.3	53.9	54.1	54.8	53.6	53.1	52.0	50.8	50.1	49.5	50.2
Detroit, Mich........	46.3	45.8	45.5	44.7	44.0	43.4	43.6	45.5	47.5	50.0	51.9	54.3	55.4	56.5	57.6	58.1	58.0	57.0	54.9	53.2	51.6	50.3	48.8	47.7	50.5
Dodge, Kans..........	47.8	46.1	44.6	44.1	43.7	42.8	41.9	42.0	46.2	50.8	55.3	58.8	61.4	63.3	65.1	66.3	67.2	66.6	65.3	62.2	56.9	53.8	51.5	49.9	53.9
Eastport, Me..........	37.0	36.6	35.9	35.3	34.7	35.3	36.5	38.1	40.6	42.2	43.6	44.7	45.5	45.6	45.9	45.6	45.4	44.2	42.2	41.3	39.8	39.1	38.5	37.9	40.5
Galveston, Tex.......	64.9	64.6	64.2	63.8	63.7	63.5	63.3	63.8	64.5	65.5	66.3	67.7	68.6	69.1	69.3	69.2	68.7	68.0	67.2	66.6	66.1	66.1	65.9	65.8	66.1
Havre, Mont..........	35.0	34.2	33.5	32.7	31.3	30.2	29.7	29.6	30.0	32.0	34.6	37.4	39.9	42.1	44.5	45.8	46.3	46.8	45.6	44.2	42.4	40.2	37.9	36.7	37.6
Independence, Cal..	58.3	57.4	56.4	55.3	53.9	52.4	51.4	50.0	50.3	52.4	56.4	59.6	63.2	65.8	67.8	68.9	70.1	70.0	69.7	69.1	66.2	63.7	61.7	60.1	60.4
Kansas City, Mo......	51.2	50.9	50.2	49.5	48.6	47.8	46.6	46.6	48.3	50.8	53.2	55.3	57.1	58.6	60.1	61.1	61.1	61.4	60.1	58.9	56.7	55.4	54.0	53.1	54.0
Key West, Fla........	71.9	71.6	71.2	71.1	71.1	70.7	71.1	72.4	73.4	74.0	74.8	75.2	75.5	76.0	75.6	75.7	75.2	74.3	73.3	72.9	72.4	72.5	72.2	72.0	73.2
Marquette, Mich	37.5	37.3	37.4	37.1	36.4	36.2	36.6	38.0	40.4	41.7	43.1	43.1	43.7	43.9	44.0	43.4	43.6	42.6	41.3	39.9	39.3	38.9	38.7	38.5	40.1
Memphis, Tenn.......	59.3	58.6	57.8	57.3	56.4	55.8	55.4	55.9	57.6	59.5	61.7	63.4	65.1	66.5	67.6	68.5	68.3	67.9	66.8	65.3	63.5	62.7	62.1	61.2	61.8
Mt. Tamalpais, Cal..	49.8	49.9	49.6	49.3	49.2	49.3	49.1	49.0	48.4	48.6	49.7	51.1	52.7	54.4	55.4	56.6	56.5	56.1	55.1	53.9	51.9	50.4	50.0	50.1	51.5
New Orleans, La.....	62.6	62.1	61.5	60.9	60.4	60.0	59.9	60.7	63.3	66.1	68.2	69.9	71.2	71.9	72.2	72.5	72.4	71.8	70.4	68.5	66.7	65.4	64.3	63.5	66.1
New York, N. Y.....	45.2	44.6	43.9	43.3	42.9	43.1	44.4	46.5	48.7	50.7	52.2	53.5	54.1	54.4	54.4	54.2	53.4	52.1	50.9	50.5	49.3	48.7	48.2	47.0	49.0
Philadelphia, Pa.....	47.6	46.8	45.9	45.0	44.3	44.2	46.0	47.9	50.7	52.7	55.2	57.7	59.7	60.9	62.0	61.9	60.6	58.7	56.4	54.5	52.2	50.9	50.1	49.0	52.5
Pittsburg, Pa.........	51.3	50.2	49.2	48.5	47.7	47.4	47.3	48.5	50.5	53.6	56.4	58.5	60.4	61.7	62.5	63.0	62.6	62.1	61.0	59.6	58.0	56.5	55.5	53.7	55.2
Portland, Oreg......	48.0	46.9	46.4	45.2	44.4	43.4	42.9	42.6	41.5	41.8	43.2	46.1	48.2	50.6	52.0	53.3	54.5	54.8	54.9	54.2	53.0	51.5	50.1	48.9	48.3
St. Louis, Mo.........	53.9	53.3	52.4	51.5	50.8	50.1	50.1	51.3	53.2	55.5	58.2	60.3	61.6	62.9	63.7	64.7	64.7	63.8	62.3	60.8	59.9	58.7	57.6	56.4	57.4
St. Paul, Minn.......	45.5	43.9	42.6	41.7	40.9	40.0	39.3	39.4	40.7	43.6	46.5	48.8	51.0	52.7	53.9	54.6	55.5	55.7	54.7	52.8	51.4	50.2	48.8	47.7	47.6
Salt Lake City, Utah.	48.3	47.2	46.1	45.4	44.8	44.0	43.1	43.4	43.5	46.3	50.5	53.7	54.8	56.1	56.8	57.3	58.0	58.1	57.5	56.7	55.6	53.2	51.1	49.6	50.9
San Diego, Cal.......	56.3	55.8	55.3	54.9	54.6	54.4	54.2	53.6	53.5	54.0	55.9	57.7	60.5	61.4	61.5	61.9	61.6	61.4	61.0	60.8	59.5	58.4	57.4	57.0	57.6
San Francisco, Cal...	51.7	51.5	50.8	50.5	50.2	49.8	49.4	49.6	49.0	49.3	50.9	52.9	55.0	57.0	58.3	58.8	59.2	59.0	58.6	57.5	56.5	55.0	53.6	52.5	53.6
Santa Fe, N. Mex ...	45.2	44.1	42.8	41.8	40.7	39.7	38.3	37.8	42.0	45.4	49.0	51.6	54.5	55.8	57.6	59.0	59.2	59.5	59.2	57.0	53.5	50.2	48.2	46.5	49.1
Savannah, Ga........	59.1	58.5	58.1	57.6	57.2	56.6	57.3	59.4	62.2	64.8	67.1	68.3	69.5	70.1	70.0	69.2	68.3	66.4	64.4	62.7	61.4	60.8	60.0	59.5	62.9
Washington, D. C....	49.0	47.3	46.5	45.6	44.7	43.8	45.0	48.9	51.7	54.7	57.7	60.0	61.4	62.7	63.5	63.5	63.3	61.9	59.8	57.2	55.3	53.4	52.0	50.8	54.1
West Indies.																									
Basseterre, St. Kitts.	75.1	74.8	74.4	74.6	74.5	75.4	77.0	78.6	79.5	80.1	80.7	80.7	81.1	80.5	79.6	79.0	78.0	76.9	76.6	76.2	76.2	75.8	75.3	75.2	77.3
Bridgetown, Bar.....	73.6	73.6	73.6	73.2	73.2	75.9	79.0	80.4	81.8	81.9	82.9	82.9	82.7	82.3	81.3	79.8	78.4	77.3	76.5	75.9	75.6	75.3	74.6	74.3	77.7
Colon, U. S. C.........	78.1	78.0	77.7	77.7	77.6	77.3	78.6	80.3	81.9	82.9	83.6	84.0	83.5	83.0	82.5	82.1	81.2	80.2	79.8	79.7	79.3	79.2	79.0	78.7	80.2
Havana, Cuba........	71.0	70.2	69.9	69.5	69.2	69.1	70.2	72.6	75.3	77.5	78.5	78.6	78.5	78.5	78.0	77.7	76.8	75.9	74.6	73.9	73.6	72.9	72.5	72.0	74.0
Kingston, Jamaica ..	70.5	69.7	69.2	69.1	69.0	68.9	70.7	76.5	79.4	81.5	82.5	82.7	82.5	81.6	80.9	79.8	79.1	78.0	76.4	75.1	73.8	72.5	71.6	71.2	75.5
Port of Spain, Trin..	72.5	72.2	71.7	71.2	71.0	73.2	77.3	80.7	82.3	83.5	84.9	85.0	85.6	85.1	84.3	82.8	80.4	77.8	76.8	76.1	75.1	74.5	73.8	73.2	78.0
Rosseau, Dominica..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
San Juan, P. R.......	72.3	72.1	71.6	71.2	71.2	71.6	74.4	77.6	79.0	79.9	81.1	81.9	82.3	81.5	81.0	80.0	78.7	77.2	76.1	75.2	74.6	74.1	73.4	72.9	76.3
Santiago de Cuba...	72.7	71.9	71.3	70.7	70.5	70.3	72.6	77.0	79.7	82.5	84.4	84.5	84.8	84.2	83.5	82.6	81.2	79.2	77.4	76.5	75.7	75.3	74.2	73.4	77.3
Santo Domingo, S. D.	70.9	70.1	69.6	69.3	69.1	68.8	71.2	75.5	78.1	79.3	80.4	80.8	80.9	80.4	79.6	78.7	77.9	76.6	75.9	75.2	74.5	73.4	72.6	71.8	75.0
Willemstad, Curaçao	76.2	76.0	75.9	75.9	75.7	76.4	78.6	79.3	80.7	81.9	82.8	83.3	83.5	83.0	82.4	81.3	79.5	78.2	77.7	77.5	77.2	77.1	77.0	76.8	78.9

TABLE IV.—*Mean pressure for each hour of seventy-fifth meridian time, April, 1899.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midn't.	Mean.
Bismarck, N. Dak....	28.172	.172	.166	.168	.165	.168	.174	.181	.182	.177	.173	.171	.162	.153	.147	.140	.135	.133	.134	.137	.143	.150	.155	.158	.159
Boston, Mass.........	29.902	.899	.896	.898	.906	.918	.925	.929	.930	.927	.916	.907	.899	.889	.885	.886	.887	.894	.905	.917	.921	.921	.919	.920	.908
Buffalo, N. Y.........	29.184	.181	.182	.186	.190	.202	.214	.219	.221	.223	.219	.212	.205	.195	.188	.183	.173	.177	.181	.186	.191	.190	.190	.192	.195
Chicago, Ill...........	29.129	.124	.123	.125	.129	.136	.146	.157	.157	.160	.160	.154	.145	.135	.120	.109	.107	.103	.104	.107	.115	.121	.119	.119	.129
Cincinnati, Ohio	29.378	.372	.374	.374	.381	.392	.404	.412	.415	.416	.412	.393	.386	.374	.358	.349	.345	.347	.347	.351	.361	.369	.371	.373	.377
Cleveland, Ohio	29.205	.200	.201	.204	.211	.225	.235	.241	.240	.240	.237	.226	.220	.211	.195	.187	.187	.189	.195	.200	.208	.209	.209	.204	.206
Detroit, Mich.........	29.241	.236	.234	.233	.237	.243	.255	.262	.267	.268	.267	.262	.253	.242	.230	.223	.221	.221	.224	.230	.239	.243	.243	.243	.242
Dodge, Kans	27.352	.354	.350	.344	.345	.343	.347	.362	.372	.374	.374	.366	.349	.333	.319	.305	.291	.285	.285	.297	.308	.321	.332	.334	.335
Eastport, Me	29.907	.903	.904	.905	.911	.919	.925	.927	.930	.930	.922	.914	.905	.896	.886	.884	.884	.889	.898	.910	.917	.919	.920	.920	.909
Galveston, Tex.......	29.933	.929	.922	.918	.918	.921	.929	.945	.957	.967	.975	.973	.962	.952	.937	.922	.910	.901	.904	.910	.919	.930	.936	.934	.933
Havre, Mont..........	27.288	.286	.284	.279	.277	.275	.275	.276	.281	.282	.282	.281	.282	.271	.261	.253	.243	.242	.244	.245	.252	.260	.269	.273	.269
Independence, Cal ..	25.914	.915	.921	.922	.921	.923	.925	.929	.947	.954	.955	.953	.953	.945	.928	.913	.897	.882	.870	.862	.860	.866	.883	.896	.914
Kansas City, Mo......	28.977	.974	.971	.967	.968	.973	.983	.993	.996	.998	.999	.993	.979	.963	.942	.927	.919	.916	.916	.919	.933	.947	.952	.957	.961
Key West, Fla.........	30.013	.006	.996	.995	.999	.006	.022	.030	.037	.044	.042	.035	.022	.006	.989	.979	.973	.973	.982	.000	.012	.020	.021	.018	.009
Marquette, Mich ...	29.148	.147	.144	.142	.144	.150	.161	.165	.163	.164	.164	.165	.158	.155	.146	.146	.150	.150	.147	.149	.155	.157	.153	.154	.153
Memphis, Tenn.......	29.605	.606	.603	.604	.609	.617	.628	.643	.652	.653	.655	.658	.633	.620	.600	.583	.570	.567	.568	.574	.579	.590	.596	.596	.609
Mt. Tamalpais, Cal .	27.564	.562	.564	.561	.554	.547	.545	.547	.558	.570	.579	.587	.597	.599	.594	.587	.577	.635	.554	.545	.532	.535	.547	.559	.564
New Orleans, La.....	29.991	.983	.978	.979	.979	.983	.995	.011	.020	.024	.026	.022	.014	.001	.987	.973	.966	.966	.964	.971	.984	.994	.995	.994	.992
New York, N. Y.....	29.726	.723	.721	.723	.7 9	.742	.752	.757	.757	.753	.744	.735	.726	.717	.706	.703	.705	.707	.716	.731	.739	.741	.741	.741	.731
Philadelphia, Pa.....	29.952	.949	.951	.955	.964	.974	.984	.988	.987	.985	.973	.961	.949	.937	.926	.924	.926	.929	.936	.950	.960	.963	.966	.967	.956
Pittsburg, Pa.........	29.139	.137	.141	.142	.148	.157	.169	.176	.175	.170	.162	.150	.139	.125	.115	.108	.111	.110	.117	.129	.141	.145	.143	.146	.141
Portland, Oreg......	29.909	.909	.917	.919	.916	.914	.913	.911	.918	.924	.928	.927	.929	.926	.916	.908	.900	.891	.885	.881	.883	.886	.893	.903	.908
St. Louis, Mo.........	29.405	.402	.401	.404	.406	.410	.422	.434	.439	.440	.441	.430	.418	.404	.385	.370	.360	.357	.358	.357	.370	.382	.387	.388	.399
St. Paul, Minn........	29.034	.037	.037	.042	.041	.043	.056	.066	.066	.065	.064	.060	.049	.041	.029	.016	.008	.007	.006	.003	.011	.019	.019	.017	.035
Salt Lake City, Utah.	25.586	.588	.586	.582	.583	.585	.588	.594	.603	.607	.605	.605	.601	.591	.584	.578	.569	.563	.559	.557	.559	.565	.575	.579	.583
San Diego, Cal.......	29.903	.902	.898	.891	.883	.876	.871	.874	.884	.896	.904	.909	.913	.910	.900	.892	.881	.871	.869	.868	.871	.880	.893	.904	.889
San Francisco, Cal...	29.890	.890	.892	.886	.878	.877	.876	.881	.894	.905	.910	.915	.916	.909	.898	.891	.879	.868	.860	.857	.857	.863	.878	.886	.886
Santa Fe, N. Mex ...	23.223	.228	.228	.226	.224	.225	.227	.234	.244	.249	.251	.254	.245	.233	.216	.202	.185	.177	.174	.173	.181	.193	.209	.216	.217
Savannah, Ga.........	29.978	.969	.969	.969	.975	.988	.006	.015	.019	.024	.016	.009	.994	.985	.965	.959	.960	.963	.969	.980	.989	.990	.989	.989	.986
Washington, D. C....	29.962	.960	.961	.963	.972	.988	.999	.005	.004	.004	.995	.980	.966	.952	.934	.929	.927	.929	.935	.945	.961	.966	.968	.971	.966
West Indies.																									
Basseterre, St. Kitts.	29.948	.933	.928	.932	.944	.963	.980	.990	.99[illegible]	.997	.991	.976	.955	.940	.932	.929	.933	.948	.957	.973	.979	.981	.975	.962	.960
Bridgetown, Bar....	29.905	.902	.906	.914	.929	.942	.954	.964	.966	.961	.943	.923	.903	.894	.890	.891	.902	.912	.923	.932	.940	.939	.930	.917	.924
Colon, U. S. C.........	29.828	.818	.806	.804	.809	.823	.840	.858	.871	.872	.864	.853	.825	.807	.788	.780	.779	.787	.806	.822	.833	.846	.848	.844	.825
Havana, Cuba........	29.951	.939	.927	.925	.930	.941	.955	.971	.976	.982	.981	.973	.956	.940	.926	.917	.916	.922	.934	.946	.960	.968	.968	.962	.949
Kingston, Jamaica..	29.645	.630	.615	.616	.623	.638	.655	.665	.671	.668	.659	.643	.623	.606	.594	.589	.592	.591	.614	.632	.647	.658	.661	.654	.633
Port of Spain, Trin..	29.835	.849	.851	.861	.877	.892	.908	.914	.915	.904	.885	.860	.836	.822	.816	.817	.828	.841	.857	.869	.882	.886	.878	.866	.865
Roseau, Dominica ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
San Juan, P. R......	29.886	.876	.873	.880	.893	.908	.924	.933	.936	.931	.919	.903	.885	.869	.860	.858	.867	.880	.896	.909	.919	.919	.910	.898	.897
Santiago de Cuba...	29.855	.843	.834	.836	.844	.859	.873	.882	.886	.882	.870	.854	.836	.818	.804	.799	.804	.815	.834	.853	.866	.873	.875	.866	.848
Santo Domingo, S. D.	29.913	.896	.891	.895	.908	.926	.942	.957	.961	.937	.948	.932	.913	.892	.881	.872	.877	.891	.906	.922	.935	.941	.938	.926	.918
Willemstad, Curaçao	29.800	.788	.783	.789	.805	.817	.834	.847	.850	.844	.827	.805	.775	.755	.737	.731	.737	.750	.772	.792	.814	.826	.822	.810	.796

TABLE V.—*Average wind movement for each hour of seventy-fifth meridian time, April, 1899.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex	10.8	11.0	10.7	10.7	12.0	10.9	11.1	10.3	11.8	12.9	13.7	13.8	14.7	13.8	14.8	14.6	14.3	14.8	13.8	11.8	9.6	9.3	10.0	10.0	12.1
Albany, N. Y	6.4	6.1	5.5	5.4	5.1	5.0	5.6	7.1	7.5	8.4	9.7	10.3	10.7	10.7	11.0	10.7	9.5	8.5	7.7	7.4	7.3	7.5	7.2	6.9	7.8
Alpena, Mich	5.9	5.7	5.6	6.4	7.1	7.3	7.8	8.0	8.8	9.7	11.0	11.6	12.3	13.3	13.7	13.2	18.1	11.1	8.9	7.6	6.0	5.9	5.3	5.1	8.8
Amarillo, Tex	17.8	17.2	16.3	15.7	16.2	18.0	17.2	16.8	17.9	21.2	22.9	22.6	22.0	21.9	21.3	21.1	20.6	20.8	21.4	21.3	17.1	16.4	17.0	18.0	19.1
Atlanta, Ga	8.7	9.1	9.1	9.4	9.4	8.7	8.6	8.7	9.9	10.7	11.4	11.0	11.1	11.5	11.3	11.8	11.4	11.0	9.3	7.9	8.5	8.6	8.2	8.7	9.7
Atlantic City, N. J	8.9	9.1	8.6	8.7	8.6	9.0	9.0	10.4	11.8	11.7	11.9	11.9	13.0	13.4	12.8	13.1	13.0	11.7	9.8	9.4	8.9	9.0	9.1	8.4	10.5
Augusta, Ga	5.6	5.2	4.7	4.8	4.6	4.6	4.9	5.7	7.7	8.6	9.8	10.3	10.5	10.2	10.3	10.1	10.1	9.5	8.1	6.5	6.5	6.3	5.5	5.5	7.3
Baker City, Oreg	4.6	4.7	5.4	4.7	5.2	5.0	5.3	4.8	5.5	5.7	5.8	5.8	6.5	7.3	7.8	8.1	8.3	8.2	9.0	9.2	8.3	6.5	4.7	4.2	6.3
Baltimore, Md	4.2	4.0	4.2	3.8	3.7	3.7	3.9	4.8	5.7	5.8	6.4	7.2	8.2	8.7	8.9	8.7	8.0	6.9	6.1	5.2	5.2	4.3	4.1	4.1	5.7
Bismarck, N. Dak	7.8	8.1	8.3	7.8	8.0	9.0	9.0	8.6	8.9	10.7	12.2	13.3	14.0	14.8	16.1	16.0	15.3	14.7	13.6	11.9	9.6	9.0	8.6	7.8	11.0
Block Island, R. I	9.6	10.2	11.0	11.1	11.7	12.2	13.0	13.4	13.5	13.8	13.5	13.2	13.7	14.6	15.3	15.9	15.8	14.5	13.7	12.8	11.9	11.1	10.6	10.3	12.8
Boise, Idaho	5.8	4.8	4.8	4.5	3.8	3.9	3.6	4.1	3.9	4.1	4.5	6.1	7.8	7.9	8.3	8.7	8.6	8.4	8.9	8.3	7.9	7.0	5.9	5.8	6.1
Boston, Mass	9.3	9.3	9.7	10.1	9.8	9.8	10.1	11.4	11.9	11.9	12.2	12.5	12.4	13.2	13.3	13.7	13.2	12.0	10.8	10.2	9.3	8.8	8.8	9.1	10.9
Buffalo, N. Y	11.2	11.1	11.2	11.1	11.6	12.4	12.6	13.1	12.7	12.7	11.9	11.7	12.3	12.3	13.0	14.1	13.5	13.2	12.1	11.0	11.1	10.8	10.9	11.0	12.0
Cairo, Ill	9.2	9.1	8.7	8.4	7.9	8.2	8.2	9.0	9.6	9.9	10.3	10.3	10.4	11.5	11.5	10.8	10.7	10.4	10.2	8.3	8.5	8.7	9.1	9.4	9.5
Cape Henry, Va	12.9	12.4	12.4	13.3	13.4	13.4	12.7	13.5	13.0	12.1	11.5	12.0	11.9	13.2	13.6	14.5	14.7	14.8	12.8	11.8	11.6	12.3	12.0	12.6	12.9
Carson City, Nev	7.1	8.5	7.8	8.2	7.6	7.2	6.6	6.4	5.1	5.8	7.1	8.8	9.3	9.6	10.2	11.4	13.0	15.8	13.8	13.4	12.2	10.9	9.2	7.9	9.3
Charleston, S. C	10.9	11.3	11.2	11.5	11.3	11.9	12.3	14.0	14.2	15.4	15.1	14.5	15.7	17.1	17.5	17.4	17.1	16.3	14.1	12.9	12.4	11.9	11.8	11.4	13.7
Charlotte, N. C	5.8	5.8	6.2	6.1	6.4	6.4	5.7	6.4	8.0	8.3	8.2	8.2	8.3	8.6	9.2	9.3	8.4	7.9	5.8	5.8	6.5	6.6	6.0	5.9	7.1
Chattanooga, Tenn	6.1	6.0	6.1	6.0	5.9	5.9	6.3	6.6	7.8	8.6	9.2	10.4	10.8	10.7	11.1	11.2	10.7	10.0	9.6	8.0	7.9	7.2	6.7	5.9	8.1
Cheyenne, Wyo	9.1	9.3	8.8	9.3	8.9	9.7	9.6	9.8	12.0	15.0	18.0	17.8	18.9	20.0	19.9	19.7	19.8	18.2	16.5	15.2	12.6	10.8	9.5	10.2	13.7
Chicago, Ill	15.4	15.7	16.2	16.1	17.1	16.7	15.6	15.8	17.0	17.1	17.3	17.3	18.8	19.3	20.2	20.0	19.6	18.2	17.7	17.5	17.1	17.0	16.9	16.2	17.3
Cincinnati, Ohio	6.6	5.9	6.3	6.2	5.9	5.4	5.9	6.1	7.7	9.1	9.6	9.2	9.4	9.8	10.3	10.3	10.3	9.1	7.9	6.8	6.1	5.8	5.6	6.0	7.5
Cleveland, Ohio	11.3	12.0	12.3	13.0	13.1	12.8	12.6	12.9	12.5	13.1	14.0	13.8	14.5	14.6	15.4	15.0	14.7	13.6	11.9	10.6	10.2	10.0	10.7	10.9	12.7
Columbia, Mo	7.7	7.8	7.7	7.6	7.3	7.5	7.7	8.0	9.1	10.0	11.4	11.6	11.6	11.0	10.9	10.9	11.3	11.3	10.5	9.4	8.9	8.8	9.1	8.4	9.4
Columbus, Ohio	5.8	5.8	5.6	5.5	5.3	5.0	5.5	5.8	6.6	7.7	8.5	8.8	9.0	9.2	9.4	9.1	8.9	8.0	7.3	6.1	6.1	5.7	5.6	5.2	6.9
Concordia, Kans	7.8	8.4	8.8	7.9	7.9	7.5	7.0	7.5	8.0	10.0	11.5	11.9	12.0	12.3	11.9	11.7	11.8	11.3	10.0	8.3	7.2	8.0	7.8	7.9	9.4
Corpus Christi, Tex	15.4	14.3	13.4	12.7	13.6	11.9	12.1	11.2	11.7	13.3	15.4	15.2	16.3	17.6	18.4	19.5	19.5	19.0	18.7	18.3	17.3	17.1	16.8	16.5	15.6
Davenport, Iowa	8.0	8.0	7.6	6.8	6.2	5.8	5.8	6.2	7.9	9.2	9.8	10.4	11.2	11.3	11.6	11.6	11.1	10.8	8.8	6.8	6.4	6.8	6.8	7.6	8.4
Denver, Colo	8.5	8.2	7.7	6.9	8.5	8.2	7.9	8.0	7.9	8.0	8.5	9.5	10.2	11.9	12.2	13.6	13.8	13.4	14.3	13.9	11.5	10.2	8.8	8.5	10.0
Des Moines, Iowa	7.4	6.3	6.4	6.5	7.1	7.2	7.5	7.8	8.9	10.4	11.9	12.3	13.2	13.6	13.6	13.8	13.6	12.2	11.0	8.6	7.4	7.3	7.6	7.8	9.6
Detroit, Mich	8.3	7.9	7.9	7.5	8.1	8.1	8.5	8.9	10.1	11.0	11.6	11.8	12.2	12.9	12.7	13.2	12.1	11.4	9.9	8.0	7.5	7.2	7.7	7.8	9.7
Dodge, Kans	11.5	11.9	11.5	10.8	10.8	10.5	11.8	11.7	12.6	15.9	17.6	17.6	18.4	18.1	17.8	17.0	16.7	16.0	15.6	13.2	9.7	10.2	11.8	11.5	13.8
Dubuque, Iowa	6.5	6.2	6.1	5.8	5.3	4.7	4.6	5.3	6.4	7.9	9.4	10.3	11.3	12.3	12.1	11.8	11.7	10.9	9.8	7.8	6.8	6.8	6.8	6.3	8.0
Duluth, Minn	8.2	9.2	9.7	10.0	10.1	9.9	9.3	8.8	9.5	10.5	11.0	10.7	11.2	11.1	11.4	11.6	12.8	11.7	10.9	9.9	8.7	8.5	8.6	8.4	10.1
Eastport, Me	7.7	7.2	7.6	8.3	7.9	8.4	9.0	10.1	10.0	10.6	11.1	11.7	11.0	11.6	11.3	11.0	10.2	9.6	8.6	7.4	7.4	7.3	7.3	7.7	9.2
Elkins, W. Va	3.6	3.5	3.4	3.3	3.3	3.1	3.8	3.8	4.9	5.4	6.3	6.4	7.0	7.7	7.7	7.5	6.9	6.9	5.3	4.6	3.8	4.0	3.7	3.1	5.0
El Paso, Tex	11.2	11.8	12.5	11.9	12.1	11.4	10.9	10.2	9.1	9.3	10.8	10.7	11.5	12.8	13.9	15.4	15.2	15.7	14.7	14.7	13.0	10.5	11.1	10.5	12.1
Erie, Pa	7.8	8.3	8.9	8.9	8.6	9.1	9.4	9.3	9.6	9.5	10.4	11.4	11.5	11.3	11.0	10.9	10.4	9.4	8.3	7.6	7.6	8.3	7.8	7.8	9.3
Escanaba, Mich	6.0	6.2	6.4	5.8	5.6	5.7	5.8	6.1	6.0	7.6	8.2	8.7	9.1	9.5	10.3	9.7	9.2	10.1	8.5	7.5	6.7	6.7	5.5	5.6	7.3
Eureka, Cal	7.3	6.9	6.2	5.9	4.9	4.8	4.0	3.5	3.0	3.0	2.7	4.0	6.4	8.8	10.6	11.4	12.2	12.8	12.9	13.3	12.6	11.8	10.1	8.1	7.8
Evansville, Ind	7.2	7.1	6.7	6.7	6.0	6.0	6.2	6.7	8.1	9.1	9.6	9.6	9.7	10.3	10.2	10.3	9.6	8.9	7.4	6.8	7.0	6.5	7.3	7.6	7.9
Fort Canby, Wash	13.0	13.5	13.4	12.8	12.1	11.8	11.9	11.6	11.7	10.7	11.5	12.2	12.6	14.5	15.0	15.1	14.3	14.3	14.8	15.7	16.1	15.1	14.1	13.8	13.4
Fort Smith, Ark	6.7	7.3	7.0	7.1	6.7	6.6	6.7	6.8	7.8	8.9	9.0	8.7	8.9	9.5	9.9	10.5	10.3	10.0	9.1	7.9	7.1	6.4	6.7	6.3	8.0
Fresno, Cal	7.5	7.2	6.8	6.9	6.8	6.0	5.6	4.6	4.4	4.8	5.7	6.4	6.8	6.8	6.6	6.9	7.1	7.2	7.1	7.2	6.8	6.2	7.0	7.1	6.5
Galveston, Tex	10.9	11.1	10.5	10.3	10.7	10.4	10.7	10.6	11.0	10.6	11.4	11.5	12.0	11.9	12.7	12.9	13.0	13.0	12.6	12.4	11.8	11.9	12.0	11.3	11.6
Grand Haven, Mich	9.4	9.1	8.9	9.4	9.5	9.3	9.7	10.1	10.7	11.9	12.5	12.3	12.7	13.0	12.4	11.2	10.5	9.8	8.9	8.1	8.1	8.2	8.7	9.3	10.2
Grand Junction, Colo	5.7	4.9	5.6	5.4	6.2	5.7	4.7	5.0	5.3	6.7	7.5	8.0	7.4	7.7	8.3	9.3	10.9	11.3	10.8	9.6	8.0	5.7	5.4	6.0	7.1
Green Bay, Wis	6.4	7.1	6.8	6.8	6.5	6.6	6.6	6.9	7.8	8.2	9.1	9.5	9.8	10.6	10.6	10.3	10.6	10.0	8.8	7.7	7.2	6.6	6.6	6.0	8.0
Hannibal, Mo	8.8	7.6	8.0	8.2	8.4	7.6	6.8	7.6	8.7	10.6	12.0	12.9	13.1	12.8	12.4	12.3	12.3	11.4	10.3	9.1	9.6	9.9	10.5	10.1	10.0
Harrisburg, Pa	6.0	6.4	5.7	5.0	5.3	5.4	5.4	6.1	6.9	7.4	7.6	8.0	9.3	10.2	10.8	10.3	10.4	10.5	9.7	8.8	8.1	6.8	5.9	5.6	7.6
Hatteras, N. C	12.6	12.7	12.9	13.2	13.1	12.8	12.6	13.5	14.3	15.2	15.2	15.0	15.3	16.0	16.5	16.0	16.0	14.6	13.1	13.1	12.6	12.2	12.8	12.2	13.9
Havre, Mont	9.0	9.3	10.0	10.0	10.0	9.1	8.7	8.7	9.2	10.4	10.8	12.5	13.6	13.7	13.7	14.9	15.7	14.5	14.0	13.5	12.0	10.4	10.1	9.1	11.4
Helena, Mont	8.2	8.1	8.1	7.9	8.9	7.9	7.2	6.9	6.8	6.5	7.3	9.2	10.2	10.3	10.7	11.8	11.5	12.1	10.7	10.7	9.1	9.3	9.9	8.6	9.1
Huron, S. Dak	10.2	10.7	10.9	11.7	11.2	11.3	11.3	11.7	13.2	14.7	14.8	14.4	14.5	16.1	16.5	15.6	15.6	15.4	15.1	13.5	11.5	10.6	10.2	10.7	13.0
Idaho Falls, Idaho	11.9	11.0	11.3	11.9	10.3	10.9	10.9	10.1	10.2	12.2	14.6	15.1	17.5	18.4	19.0	19.1	19.8	20.1	19.7	18.4	15.8	13.6	12.5	11.2	14.4
Independence, Cal	10.0	9.9	9.4	9.0	8.5	7.9	8.1	8.4	9.2	9.6	10.4	11.5	11.7	11.3	12.4	12.6	12.9	13.2	13.9	13.7	13.4	12.1	11.4	10.5	10.9
Indianapolis, Ind	10.2	10.1	9.5	8.7	8.3	8.2	8.3	9.3	10.9	12.4	12.6	13.3	13.8	14.0	14.1	13.9	13.4	12.8	11.1	9.6	9.7	9.7	10.3	10.2	11.0
Jacksonville, Fla	6.1	6.7	6.7	6.6	6.3	6.7	6.3	7.4	9.1	9.9	11.1	11.5	11.2	11.7	11.8	11.8	11.2	10.3	9.4	8.1	7.4	7.3	7.0	6.5	8.7
Jupiter, Fla	9.7	9.2	8.8	8.9	8.8	9.3	10.0	10.4	10.6	12.2	12.9	13.5	14.2	13.8	13.6	13.7	13.7	12.9	11.1	10.8	11.0	11.0	10.7	10.3	11.3
Kansas City, Mo	7.2	7.8	8.0	7.3	7.5	8.1	8.6	8.4	9.9	11.0	11.4	12.0	11.6	12.3	13.1	13.0	13.0	12.8	11.3	9.9	9.1	8.5	8.3	7.7	9.9
Keokuk, Iowa	7.6	7.4	7.1	6.4	6.2	5.9	6.2	6.6	7.1	8.5	9.8	10.6	11.3	10.1	10.5	10.4	10.3	10.1	8.0	6.8	7.1	7.2	7.5	8.0	8.2
Key West, Fla	10.8	10.4	9.8	9.3	9.4	9.3	9.5	10.5	11.3	11.8	12.0	11.9	12.4	11.7	11.4	11.8	12.0	11.7	12.3	12.0	12.3	11.8	11.5	10.6	11.1
Kittyhawk, N. C	13.2	13.8	14.2	13.6	13.5	13.2	13.3	14.9	15.7	15.7	14.8	14.1	13.6	15.1	15.8	15.8	15.9	15.9	14.5	14.4	14.0	14.3	13.1	12.9	14.4
Knoxville, Tenn	6.9	6.6	6.4	5.7	5.8	6.1	6.5	6.4	7.2	7.6	8.1	8.6	9.2	9.5	9.2	9.6	9.3	8.6	8.8	8.4	7.8	7.8	7.3	7.0	7.7
La Crosse, Wis	6.0	6.2	6.0	6.3	5.6	6.1	6.2	6.4	6.3	7.0	7.6	8.3	8.7	9.4	9.4	9.9	9.8	9.1	8.6	7.2	6.0	5.6	6.9	6.8	7.3
Lander, Wyo	4.8	4.7	4.4	4.9	4.1	4.2	4.1	3.5	3.8	4.6	5.9	6.5	8.1	9.8	10.2	10.0	10.8	10.7	9.8	10.2	8.6	7.6	6.3	5.4	6.8
Lexington, Ky	11.1	10.7	11.0	10.7	10.4	10.2	10.1	10.6	11.3	12.0	12.7	12.4	11.9	11.9	11.4	12.1	12.3	10.2	9.0	8.2	8.9	9.6	10.3	10.3	10.8
Little Rock, Ark	8.3	8.4	8.3	7.8	8.2	7.6	6.9	6.9	7.5	8.1	9.4	10.0	9.9	9.9	9.7	10.4	9.8	9.1	7.9	6.9	6.0	6.2	7.5	7.6	8.3
Los Angeles, Cal	2.7	2.5	2.5	2.6	2.7	2.5	2.7	2.8	2.6	2.9	3.3	4.1	4.4	5.2	6.4	8.1	9.1	9.5	9.1	8.3	7.2	5.0	4.0	2.8	4.7
Louisville, Ky	8.1	7.5	7.4	7.4	7.7	7.4	7.2	7.5	8.8	10.2	10.6	10.5	10.5	11.1	11.2	11.2	11.2	10.6	9.7	8.8	8.3	7.7	7.5	7.8	9.0
Lynchburg, Va	2.7	2.6	2.7	2.9	2.6	2.0	2.2	2.8	3.7	4.6	5.0	5.4	6.6	6.8	7.0	7.0	7.0	6.3	5.1	4.0	3.4	2.8	2.2	2.3	4.2
Marquette, Mich	8.1	8.7	9.4	9.0	8.9	9.2	8.1	8.4	9.8	10.0	10.5	10.9	11.1	9.8	11.3	10.6	9.8	8.9	7.4	5.8	5.7	6.8	7.5	7.1	8.9
Memphis, Tenn	10.6	10.7	10.7	10.7	11.0	11.1	10.7	10.8	11.4	11.9	11.8	11.7	11.3	11.3	12.1	13.1	12.3	11.4	10.2	9.6	9.8	10.6	9.9	10.6	11.0
Milwaukee, Wis	8.8	8.5	9.4	9.1	9.4	9.1	9.0	9.2	9.5	10.5	10.9	11.2	12.7	13.2	13.7	13.4	13.4	12.8	11.7	9.6	8.7	8.4	8.7	8.3	10.4
Minneapolis, Minn	10.3	10.3	10.3	9.7	9.7	10.2	10.4	10.8	10.9	10.9	11.6	12.5	13.8	13.2	13.5	14.0	13.6	13.3	13.0	11.2	10.2	10.0	10.7	10.7	11.5
Mobile, Ala	5.8	6.1	5.8	5.5	5.5	5.4	5.3	6.0	7.3	7.8	8.9	10.2	11.4	13.0	14.0	14.2	13.9	12.8	11.3	8.9	7.9	6.6	5.7	5.5	8.5
Montgomery, Ala	6.6	6.4	5.8	5.9	6.0	5.6	5.7	6.8	8.4	8.9	9.3	9.5	9.6	9.0	10.0	9.4	9.3	9.1	8.1	6.4	6.8	6.7	7.0	6.9	7.6
Moorhead, Minn	10.0	10.0	9.7	8.9	9.0	8.8	9.3	9.4	9.6	10.5	12.1	12.5	13.4	13.2	13.6	13.4	12.9	12.9	11.9	11.4	9.5	9.2	9.7	9.7	10.9
Mount Tamalpais, Cal	25.8	25.4	24.8	24.6	23.7	21.6	21.3	20.9	19.3	17.5	15.6	13.3	12.3	11.6	10.9	11.2	12.9	15.4	18.1	21.4	24.5	27.3	27.4	28.0	19.8
Nantucket, Mass	8.8	9.4	9.9	10.0	10.3	10.4	11.3	11.9	12.7	12.6	12.8	12.4	12.2	12.8	12.3	12.6	12.2	11.7	10.3	9.8	9.8	9.8	9.5	9.4	11.0
Nashville, Tenn	7.1	6.5	6.4	6.1	5.8	6.0	6.0	6.2	8.5	9.5	10.5	11.1	11.0	11.1	11.1	11.4	11.2	11.1	9.4	7.6	6.9	6.1	6.7	7.1	8.3
Neah, Wash	5.2	5.9	5.7	4.9	5.1	5.6	5.7	6.1	5.6	5.3	6.2	7.1	7.9	9.8	9.2	10.5	10.1	10.8	9.6	9.5	9.1	7.2	6.6	6.1	7.3
New Haven, Conn	6.4	6.6	7.0	6.8	7.0	6.2	6.4	8.3	9.6	10.3	12.2	12.8	13.5	13.6	13.3	12.6	12.2	10.2	8.2	7.4	6.4	6.3	6.0	6.6	9.0
New Orleans, La	8.0	8.0	8.4	7.1	6.9	6.9	7.6	8.0	8.6	10.3	11.3	11.1	12.0	12.0	11.9	11.2	10.6	10.3	9.3	8.4	8.2	8.2	8.0	7.7	9.2

TABLE V.—*Average wind movement, etc.*—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
New York, N. Y	13.2	12.6	12.5	12.3	12.1	12.2	12.2	13.2	13.5	14.1	14.5	14.6	15.7	17.0	17.2	17.7	17.7	17.2	16.6	15.3	14.9	13.4	14.0	13.8	14.5
Norfolk, Va	8.0	6.9	6.9	7.4	7.4	7.4	8.0	8.7	9.5	9.7	9.6	9.1	10.3	10.6	11.8	12.1	12.2	12.0	10.9	10.0	9.4	9.0	8.8	7.9	9.3
Northfield, Vt	6.3	5.6	5.8	5.8	5.8	5.6	5.2	6.1	7.3	9.9	10.5	11.3	11.8	12.0	11.7	11.5	11.1	10.0	8.5	7.0	6.4	6.5	6.8	6.2	8.1
North Platte, Nebr	9.8	9.1	9.1	8.4	8.5	7.8	7.4	7.7	8.7	11.1	12.5	13.1	13.2	13.8	13.8	15.1	15.2	15.2	15.4	13.6	11.8	10.9	10.7	10.6	11.3
Oklahoma, Okla	12.0	12.7	13.2	12.7	12.5	11.9	12.1	13.1	14.0	16.4	17.3	17.1	16.2	17.5	17.8	17.8	17.3	17.6	15.9	14.2	12.2	12.0	12.4	12.1	14.5
Omaha, Nebr	7.3	7.7	7.6	7.7	7.6	7.6	7.9	8.2	8.7	10.2	11.2	11.4	12.0	12.3	12.3	12.6	12.3	11.3	10.3	9.4	8.2	7.9	8.3	7.8	9.5
Oswego, N. Y	9.6	9.2	9.5	10 0	10.1	10.1	10.4	11.2	11.3	11.3	11.1	10.9	11.4	11.1	10.4	10.4	9.8	9.2	8.4	8.8	8.9	9.3	9.1	9.2	10.0
Palestine, Tex	8.3	8.2	8.4	9.1	8.0	7.3	6.8	7.0	7.8	9.8	10.4	10.2	10.2	10.4	11.0	11.3	10.9	10.6	9.8	9.6	8.2	8.2	8.8	8.2	9.1
Parkersburg, W. Va	5.3	4.6	4.5	4.8	4.8	4.1	4.5	5.1	5.9	6.8	7.9	7.7	8.4	8.5	8.3	8.4	7.8	7.5	5.4	4.0	3.4	3.7	4.1	4.3	5.8
Pensacola, Fla	8.4	8.2	8.0	7.7	8.2	8.3	8.3	8.6	9.1	10.3	11.3	11.0	11.3	11.9	12.4	13.5	13.1	11.9	11.1	9.9	8.5	8.0	8.4	8.7	9.8
Phenix, Ariz	3.7	3.6	3.8	3.6	3.9	3.9	4.3	4.5	4.5	4.6	4.9	6.2	6.1	5.9	6.5	6.7	7.0	6.7	6.7	6.2	4.7	4.6	4.6	3.8	5.0
Philadelphia, Pa	8.9	8.1	8.4	8.2	7.7	7.3	7.8	8.6	9.5	9.6	10.1	10.0	10.5	11.2	11.8	11.6	12.5	11.9	10.9	10.2	10.5	9.4	8.6	8.4	9.7
Pierre, S. Dak	12.5	12.4	12.0	11.2	11.7	10.6	10.5	10.7	11.8	12.0	12.9	14.5	15.8	14.9	14.6	14.9	15.1	14.9	15.2	15.0	14.3	13.5	13.2	14.0	13.3
Pittsburg, Pa	4.2	4.6	4.2	4.0	4.0	4.3	4.3	5.4	5.0	5.4	5.9	5.9	6.3	6.4	6.8	6.7	7.2	6.1	5.3	4.5	4.7	4.4	4.7	4.6	5.2
Point Reyes Lt., Cal	26.2	26.3	25.4	24.2	22.2	22.6	23.4	21.8	21.7	21.7	19.9	18.7	19.7	19.8	20.9	22.9	25.1	26.3	28.4	29.3	30.4	30.6	30.6	28.9	24.5
Port Crescent, Wash	3.9	4.3	3.8	3.5	3.2	3.2	2.6	2.9	2.9	3.0	3.2	4.6	6.4	7.6	7.9	7.8	7.9	7.8	7.0	6.8	6.5	4.8	3.9	3.4	5.0
Port Huron, Mich	9.2	9.1	8.7	9.0	8.7	8.8	9.1	9.5	10.8	11.8	12.5	13.5	13.8	14.1	13.9	13.3	12.7	11.8	10.1	9.2	9.7	9.3	8.8	8.9	10.7
Portland, Me	4.8	4.8	5.0	5.3	5.5	6.0	6.0	6.4	6.7	7.4	8.5	9.1	9.6	10.0	9.7	9.8	9.5	8.1	6.9	6.6	6.6	6.6	5.6	4.6	7.0
Portland, Oreg	9.6	9.4	8.8	[illegible]	8.6	8.2	8.3	8.4	8.7	8.4	9.8	10.4	10.3	11.0	12.1	12.3	12.1	11.8	12.9	12.8	12.5	10.8	10.0	9.5	10.2
Pueblo, Colo	6.6	5.3	5.1	5.0	5.4	6.1	6.4	6.7	8.0	9.0	10.2	11.1	12.6	12.2	12.9	13.6	14.3	13.7	14.0	12.9	11.8	10.0	8.1	7.4	9.5
Raleigh, N. C	5.5	5.5	5.1	5.2	5.1	5.2	5.1	6.3	7.0	7.2	7.4	7.4	7.7	8.1	8.2	8.0	7.5	6.7	5.6	5.1	5.3	5.1	5.6	5.5	6.3
Rapid City, S. Dak	6.4	7.1	7.1	7.6	6.3	6.7	6.7	8.0	7.6	8.6	9.8	10.9	12.4	12.9	12.5	12.1	13.3	12.5	12.6	11.3	9.0	7.5	6.1	6.0	9.3
Red Bluff, Cal	6.4	6.3	6.5	5.7	5.5	5.2	5.4	4.9	5.3	5.8	7.0	8.0	8.8	8.6	8.2	9.0	7.4	7.8	8.2	8.3	7.8	7.0	7.1	6.6	6.9
Richmond, Va	5.4	5.3	5.0	5.3	4.9	4.9	4.9	5.6	6.1	6.8	7.2	7.6	7.9	8.1	8.7	8.7	9.0	8.4	7.4	6.8	6.2	6.1	6.2	5.7	6.6
Rochester, N. Y	6.1	6.0	5.7	5.7	6.1	6.6	6.9	7.4	7.8	8.0	8.6	8.4	9.2	9.2	9.5	9.4	9.1	8.1	6.7	5.8	5.8	5.5	5.8	5.7	7.2
Roseburg, Oreg	3.3	2.7	3.0	3.1	2.5	2.6	2.2	2.6	2.2	2.7	3.0	3.4	4.5	5.0	5.8	6.1	6.3	7.8	7.4	7.1	7.2	6.1	5.1	4.1	4.4
Sacramento, Cal	7.4	7.1	7.4	7.3	8.1	7.9	7.8	8.9	7.9	7.9	8.2	9.9	10.5	10.3	10.3	10.7	10.6	9.8	10.3	10.4	9.9	8.8	8.2	7.5	8.9
St. Louis, Mo	9.2	8.8	8.4	8.7	8.1	8.2	7.9	8.4	8.9	9.2	9.3	9.5	10.3	11.2	11.4	11.0	11.0	10.9	10.5	9.3	8.8	9.3	9.4	9.2	9.5
St. Paul, Minn	5.4	5.7	6.1	5.4	5.9	5.5	5.5	6.6	7.2	7.9	9.0	9.6	10.5	10.6	11.2	11.0	11.2	10.3	9.7	8.3	6.2	5.9	5.9	5.6	7.8
Salt Lake City, Utah	4.6	4.1	4.1	4.6	5.0	5.3	5.0	4.4	4.0	4.1	6.0	8.8	11.4	12.1	11.7	12.4	12.7	11.9	10.9	9.4	7.9	6.4	6.1	5.7	7.4
San Antonio, Tex	10.5	9.2	8.8	8.3	7.5	7.4	7.4	7.4	8.0	10.8	12.1	11.9	12.7	12.9	13.3	13.5	14.6	14.2	15.1	14.4	13.8	13.6	12.3	11.0	11.3
San Diego, Cal	4.2	4.0	3.9	4.0	3.7	4.1	4.1	4.0	3.7	3.4	3.9	5.2	7.5	9.1	10.6	10.9	10.5	9.9	9.4	8.7	7.6	6.4	4.9	4.0	6.2
Sandusky, Ohio	6.9	7.5	7.4	7.5	7.2	7.3	7.1	7.2	7.8	8.8	8.4	9.1	9.5	10.0	10.0	9.9	9.6	8.9	7.7	7.1	6.5	6.7	6.8	6.5	8.0
Sandy Hook, N. J	7.4	8.0	8.1	9.0	8.3	7.8	7.9	7.1	7.5	7.0	7.3	7.1	8.5	9.2	9.1	9.7	9.8	9.6	9.6	9.1	8.6	8.1	7.7	7.7	8.3
San Francisco, Cal	11.2	10.0	9.2	8.1	7.5	7.9	7.4	8.2	7.0	6.9	7.6	8.3	8.8	9.4	12.2	14.8	17.7	18.9	18.7	18.8	17.7	16.9	14.0	12.4	11.7
San Luis Obispo, Cal	3.2	2.7	2.7	3.2	3.2	3.3	3.6	3.5	3.2	3.9	4.5	5.4	6.5	7.5	8.7	9.4	9.7	9.6	8.2	8.4	7.3	6.5	4.7	3.8	5.5
Santa Fe, N. Mex	5.8	5.7	5.2	5.1	4.8	4.4	3.9	3.3	3.5	5.6	8.2	9.6	10.4	11.3	12.8	13.3	13.5	12.9	12.5	12.0	9.1	7.0	6.7	6.6	8.1
Sault Ste. Marie, Mich	6.2	5.9	5.4	6.1	6.5	6.4	6.6	7.0	8.2	10.4	11.3	12.1	13.2	13.5	13.6	13.8	13.1	12.6	11.8	9.4	7.8	7.0	7.0	6.6	9.2
Savannah, Ga	7.7	7.6	8.0	8.4	8.9	8.9	9.0	10.5	11.2	11.4	12.2	13.1	14.0	13.7	14.2	14.2	13.7	12.8	10.5	9.8	8.4	7.9	7.6	7.8	10.5
Seattle, Wash	6.2	6.7	7.3	6.9	6.2	6.2	6.2	6.1	6.2	6.6	7.1	7.2	8.2	9.5	10.5	9.6	9.9	9.7	9.6	9.6	8.6	7.6	7.4	7.2	7.8
Shreveport, La	8.0	7.8	7.1	7.0	6.7	6.8	6.6	6.8	7.3	8.6	8.7	8.9	9.7	9.9	9.8	10.2	9.7	9.8	9.3	9.1	8.6	8.9	8.8	8.7	8.5
Sioux City, Iowa	12.7	12.5	12.3	12.6	13.2	13.5	12.6	13.5	14.0	15.2	15.9	16.6	18.9	19.2	18.6	17.8	16.9	16.6	15.6	14.1	13.5	12.8	12.5	13.5	14.8
Spokane, Wash	6.7	7.0	6.9	7.1	7.2	7.4	7.6	8.1	6.7	8.0	8.9	9.9	10.2	10.7	11.0	11.9	11.5	12.3	11.5	11.1	10.1	8.0	6.7	6.0	8.8
Springfield, Ill	9.5	9.4	9.0	8.4	8.4	8.6	8.1	8.3	9.4	10.1	11.3	11.8	12.4	12.4	12.2	12.7	12.7	11.3	10.6	8.4	8.7	9.1	9.3	9.9	10.1
Springfield, Mo	10.5	10.5	10.3	10.2	10.6	10.1	10.1	10.6	11.3	12.9	13.9	13.5	13.9	13.3	12.9	14.1	14.7	14.5	13.1	10.8	10.3	10.5	10.6	10.6	11.8
Tacoma, Wash	7.5	7.8	7.1	7.0	7.0	7.2	7.2	6.8	6.6	6.6	7.3	8.4	9.6	9.9	10.1	10.5	11.1	10.3	10.2	9.4	9.6	9.2	8.2	7.8	8.4
Tampa, Fla	5.4	5.5	5.2	5.6	5.9	6.2	5.8	6.7	7.5	8.6	9.1	9.1	9.2	9.2	9.3	9.3	9.4	9.2	7.6	6.4	5.7	5.7	6.0	5.3	7.2
Toledo, Ohio	8.7	8.3	8.4	8.6	8.7	8.7	8.5	9.1	10.3	10.4	11.0	11.8	12.4	12.9	13.2	12.9	12.9	11.9	10.4	8.6	8.5	8.8	8.7	8.7	10.1
Vicksburg, Miss	7.8	7.8	7.8	8.0	8.1	8.6	8.4	8.3	8.0	8.3	8.9	9.0	9.6	9.2	9.1	9.0	8.4	7.4	6.0	5.5	6.4	6.3	8.0	8.3	8.0
Vineyard Haven, Mass	7.0	6.9	7.3	7.5	7.9	7.5	8.6	9.9	10.1	10.4	10.4	10.6	11.4	11.2	11.1	10.8	10.0	9.3	8.6	7.6	7.4	7.2	7.2	7.5	8.9
Walla Walla, Wash	6.8	6.9	7.4	6.4	6.7	6.3	6.6	6.6	7.0	7.0	7.8	8.7	9.4	9.6	9.7	10.0	9.6	9.7	9.5	9.4	9.0	7.8	7.8	8.0	8.1
Washington, D. C	5.4	4.8	4.8	4.3	4.1	3.6	4.0	5.7	7.5	8.6	9.7	10.1	10.3	11.5	11.2	10.9	10.6	10.1	8.4	6.5	6.2	5.7	5.6	6.1	7.3
Wichita, Kans	8.7	8.5	8.0	8.7	9.0	8.9	9.4	10.0	11.3	12.9	13.9	14.4	14.5	15.0	14.7	14.2	13.9	13.9	12.3	10.1	7.8	7.8	8.1	8.7	11.0
Williston, N. Dak	7.1	7.3	7.4	8.4	7.8	6.8	6.9	7.2	8.1	9.0	9.9	11.4	12.9	14.0	14.2	15.4	15.5	14.8	14.7	12.6	10.0	8.4	8.2	7.0	10.2
Wilmington, N. C	7.7	7.6	7.4	7.5	7.8	7.8	8.2	10.0	11.3	11.8	12.1	12.8	13.0	13.9	13.4	13.5	13.3	12.5	10.3	9.1	8.6	8.4	7.9	7.7	10.2
Winnemucca, Nev	10.7	9.9	10.0	11.6	10.8	10.9	10.9	11.3	10.7	11.0	11.2	10.6	11.9	12.4	13.1	13.7	14.9	14.7	14.8	14.5	12.2	10.9	11.0	10.7	11.8
Woods Hole, Mass	11.8	11.9	12.6	13.4	13.1	13.5	13.4	14.9	14.1	14.1	13.9	13.6	15.8	16.0	16.0	16.1	14.6	13.8	12.7	11.3	11.0	10.8	10.6	11.9	13.4
Yankton, S. Dak	10.5	10.7	10.7	9.8	9.1	8.3	8.9	9.3	9.3	11.8	12.9	12.9	14.0	14.0	14.1	13.6	13.0	12.2	11.5	9.8	9.9	10.0	10.6	10.6	11.1
West Indies.																									
Basseterre, St. Kitts	7.8	7.9	8.1	8.1	8.1	8.5	9.2	10.6	12.3	12.2	12.3	12.7	11.6	11.7	11.5	10.6	10.1	8.8	8.2	8.3	8.7	8.3	8.2	8.2	9.7
Bridgetown, Bar	4.3	4.5	4.8	4.8	4.8	5.6	8.5	11.1	12.3	12.8	12.9	13.2	12.8	12.9	12.0	11.5	10.1	7.3	6.2	6.2	5.3	5.4	5.4	5.2	8.3
Havana, Cuba	7.3	6.6	6.4	6.4	6.4	7.0	6.9	8.2	11.5	13.2	13.2	14.2	16.3	16.6	17.4	17.3	17.3	16.1	14.7	12.9	11.1	9.8	8.9	8.2	11.4
Kingston, Jamaica	4.6	4.7	4.8	5.3	5.3	5.0	4.7	3.8	4.2	6.3	9.8	12.6	13.5	14.2	13.6	12.3	10.8	8.3	6.0	4.7	4.1	4.1	4.6	4.6	7.2
Port of Spain, Trin'd	2.7	3.1	2.9	2.5	2.2	2.3	3.6	7.4	9.4	10.3	10.5	10.6	10.5	10.9	10.7	10.6	9.3	7.0	4.8	3.8	3.3	3.0	2.9	2.9	6.1
San Juan, Porto Rico	3.3	3.0	3.1	3.4	3.3	3.3	3.6	4.9	7.0	8.9	10.6	11.6	12.0	11.4	11.6	10.8	10.1	8.8	7.5	6.4	5.1	4.5	4.1	3.5	6.7
Santiago de Cuba	3.9	4.0	3.6	3.6	3.3	3.2	3.5	4.4	5.8	6.6	7.5	8.6	10.1	10.1	9.9	9.2	8.4	6.9	5.0	5.0	5.0	4.5	4.6	4.2	5.9
Santo Domingo, S. D	3.0	3.3	3.2	3.0	3.4	3.3	3.8	3.8	4.3	5.2	6.0	7.1	7.2	7.6	7.8	7.3	6.8	5.8	4.9	4.5	3.8	3.0	3.0	2.8	4.8
Willemstad, Curaçao	11.0	10.8	10.7	10.4	10.4	10.5	12.3	14.8	15.7	15.8	15.9	15.9	16.1	16.5	16.4	16.0	15.5	14.3	13.5	13.1	12.7	12.3	11.6	11.6	13.5

TABLE VI.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of April, 1899.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
New England.						
Eastport, Me	26	16	12	18	n. 31 w.	12
Portland, Me	19	18	8	29	n. 87 w.	21
Northfield, Vt	18	35	5	11	s. 19 w.	18
Boston, Mass	21	17	12	23	n. 70 w.	12
Nantucket, Mass	19	15	15	25	n. 68 w.	11
Woods Hole, Mass.*	6	13	9	12	s. 23 w.	8
Block Island, R. I	18	15	14	26	n. 76 w.	12
New Haven, Conn	24	23	14	20	n. 80 w.	6
Middle Atlantic States.						
Albany, N. Y	19	19	9	19	w.	10
Binghamton, N. Y.†	13	7	7	10	n. 27 w.	7
New York, N. Y	21	16	18	20	n. 22 w.	5
Harrisburg, Pa.†	10	2	14	9	n. 32 e.	9
Philadelphia, Pa	20	20	11	22	w.	11
Atlantic City, N. J	14	20	15	26	s. 61 w.	12
Cape May, N. J	18	24	15	16	s. 9 w.	6
Baltimore, Md	12	19	27	17	s. 55 e.	12
Washington, D. C	15	23	17	15	s. 14 e.	8
Lynchburg, Va	12	24	22	18	s. 18 e.	13
Norfolk, Va	20	22	24	9	s. 82 e.	15
Richmond, Va	20	24	16	15	s. 14 e.	4
South Atlantic States.						
Charlotte, N. C	18	17	26	14	n. 85 e.	12
Hatteras, N. C	28	15	20	8	n. 43 e.	18
Raleigh, N. C	27	15	18	15	n. 14 e.	12
Wilmington, N. C	24	14	21	15	n. 31 e.	12
Charleston, S. C	24	11	23	13	n. 38 e.	16
Augusta, Ga	18	13	17	24	n. 54 w.	9
Savannah, Ga	20	18	18	16	n. 45 e.	3
Jacksonville, Fla	21	14	27	12	n. 65 e.	17
Florida Peninsula.						
Jupiter, Fla	24	14	16	15	n. 6 e.	10
Key West, Fla	19	8	34	9	n. 66 e.	27
Tampa, Fla	30	4	17	21	n. 9 w.	26
Eastern Gulf States.						
Atlanta, Ga	16	14	23	22	n. 27 e.	2
Pensacola, Fla	17	25	16	19	s. 21 w.	8
Mobile, Ala	17	28	14	10	s. 20 e.	12
Montgomery, Ala	15	19	25	13	s. 72 e.	13
Meridian, Miss.†	7	12	13	8	s. 45 e.	7
Vicksburg, Miss	10	27	21	13	s. 25 e.	19
New Orleans, La	14	31	22	9	s. 38 e.	22
Western Gulf States.						
Shreveport, La	15	29	23	7	s. 49 e.	21
Fort Smith, Ark	13	23	25	7	s. 61 e.	21
Little Rock, Ark	14	28	16	15	s. 4 e.	14
Corpus Christi, Tex	9	30	33	4	s. 54 e.	36
Fort Worth, Tex†	7	14	7	8	s. 8 w.	7
Galveston, Tex	11	29	31	8	s. 52 e.	29
Palestine, Tex	18	30	19	10	s. 37 w.	15
San Antonio, Tex	15	25	30	6	s. 67 e.	26
Ohio Valley and Tennessee.						
Chattanooga, Tenn	13	24	19	17	s. 10 e.	11
Knoxville, Tenn	24	13	21	20	n. 5 e.	11
Memphis, Tenn	17	28	16	14	s. 10 e.	11
Nashville, Tenn	15	26	15	15	s.	11
Lexington, Ky.†	8	15	7	7	s.	7
Louisville, Ky	15	23	19	15	s. 27 e.	9
Evansville, Ind.†	7	13	11	7	s. 34 e.	7
Indianapolis, Ind	18	25	14	16	s. 16 w.	7
Cincinnati, Ohio	18	22	24	14	s. 68 e.	11
Columbus, Ohio	16	21	17	22	s. 45 w.	7
Pittsburg, Pa	23	17	13	22	n. 33 w.	17
Parkersburg, W. Va	17	22	13	23	s. 63 w.	11
Elkins, W. Va	21	19	16	16	n.	2
Lower Lake Region.						
Buffalo, N. Y	10	20	15	26	s. 48 w.	15
Oswego, N. Y	14	24	21	19	s. 11 e.	10
Rochester, N. Y	15	20	14	26	s. 67 w.	13
Erie, Pa	14	16	9	29	s. 84 w.	20
Cleveland, Ohio	15	22	16	21	s. 36 w.	9
Sandusky, Ohio	14	18	21	22	s. 14 w.	4
Toledo, Ohio	15	17	19	20	s. 27 w.	2
Detroit, Mich	15	17	18	23	s. 68 w.	5
Upper Lake Region.						
Alpena, Mich	15	21	20	15	s. 40 e.	8
Escanaba, Mich	24	20	16	11	n. 51 e.	6
Grand Haven, Mich	16	19	19	20	s. 18 w.	3
Marquette, Mich	19	16	15	22	n. 67 w.	8
Port Huron, Mich	26	20	8	15	n. 49 w.	9
Sault Ste. Marie, Mich	7	8	27	28	s. 45 w.	[illegible]
Chicago, Ill	15	19	20	17	s. 27 e.	5
Milwaukee, Wis	19	20	15	17	s. 45 w.	3
Green Bay, Wis	16	25	16	16	s.	9
Duluth, Minn	35	3	22	20	n. 4 e.	32
North Dakota.						
Moorhead, Minn	27	15	18	22	n. 18 w.	13
Bismarck, N. Dak	25	12	18	19	n. 4 w.	13
Williston, N. Dak	25	14	9	21	n. 47 w.	16
Upper Mississippi Valley.						
St. Paul, Minn	18	21	16	24	s. 69 w.	8
La Crosse, Wis.†	5	15	10	7	s. 17 e.	10
Davenport, Iowa	15	17	18	25	s. 74 w.	7
Des Moines, Iowa	24	19	14	13	n. 11 e.	5
Dubuque, Iowa	19	19	16	20	w.	4
Keokuk, Iowa	16	23	15	22	s. 45 w.	10
Cairo, Ill	18	26	17	11	s. 37 e.	10
Springfield, Ill	17	25	11	16	s. 32 w.	9
Hannibal, Mo.†	7	7	10	7	e.	3
St. Louis, Mo	23	25	13	11	s. 81 e.	12
Missouri Valley.						
Columbia, Mo.*	9	12	11	8	s. 45 e.	4
Kansas City, Mo	24	17	21	15	n. 41 e.	9
Springfield, Mo	16	30	13	11	s. 8 e.	14
Lincoln, Nebr	22	23	17	13	e.	4
Omaha, Nebr	24	21	11	13	n. 34 w.	4
Sioux City, Iowa†	11	10	2	7	n. 79 w.	5
Pierre, S. Dak	18	13	22	22	n.	5
Huron, S. Dak	17	15	21	25	n. 63 w.	4
Yankton, S. Dak†	8	7	8	13	n. 79 w.	5
Northern Slope.						
Havre, Mont	17	13	16	30	n. 74 w.	15
Miles City, Mont	18	16	6	26	n. 84 w.	20
Helena, Mont	12	18	5	40	s. 80 w.	36
Rapid City, S. Dak	20	10	16	28	n. 50 w.	16
Cheyenne, Wyo	21	17	4	30	n. 81 w.	26
Lander, Wyo	11	26	12	29	s. 48 w.	23
North Platte, Nebr	21	20	7	26	n. 87 w.	19
Middle Slope.						
Denver, Colo	20	20	12	16	w.	4
Pueblo, Colo	21	12	21	18	n. 18 e.	10
Concordia, Kans	18	23	17	12	s. 45 e.	7
Dodge, Kans	24	21	16	13	n. 45 e.	4
Wichita, Kans	24	28	14	4	s. 68 e.	11
Oklahoma, Okla	15	32	14	6	s. 25 e.	19
Southern Slope.						
Abilene, Tex	16	28	20	15	s. 23 e.	13
Amarillo, Tex	17	25	13	15	s. 14 w.	8
Southern Plateau.						
El Paso, Tex	17	10	13	32	n. 70 w.	20
Santa Fe, N. Mex	14	25	15	23	s. 36 w.	14
Flagstaff, Ariz	17	18	14	23	s. 84 w.	9
Phenix, Ariz	15	7	28	21	n. 41 e.	11
Yuma, Ariz	14	19	13	27	s. 70 w.	15
Independence, Cal	20	15	12	31	n. 75 w.	20
Middle Plateau.						
Carson City, Nev	14	16	7	35	s. 86 w.	28
Winnemucca, Nev	17	17	15	27	w.	12
Salt Lake City, Utah	18	19	21	18	s. 72 e.	3
Grand Junction, Colo	23	15	12	26	n. 60 w.	16
Northern Plateau.						
Baker City, Oreg	20	28	12	17	s. 32 w.	9
Boise, Idaho	17	13	21	24	n. 37 w.	5
Idaho Falls, Idaho	8	41	7	13	s. 10 w.	34
Spokane, Wash	6	31	13	18	s. 11 w.	26
Walla Walla, Wash	4	37	10	22	s. 20 w.	35
North Pacific Coast Region.						
Fort Canby, Wash	14	18	13	23	s. 68 w.	11
Neah, Wash	4	8	17	37	s. 79 w.	20
Port Crescent, Wash.*	0	2	9	20	s. 80 w.	11
Seattle, Wash	13	31	20	14	s. 18 e.	19
Tacoma, Wash	12	29	4	31	s. 57 w.	32
Portland, Oreg	13	30	4	27	s. 54 w.	29
Roseburg, Oreg	28	14	18	19	n. 4 w.	14
Middle Pacific Coast Region.						
Eureka, Cal	24	16	11	27	n. 53 w.	20
Mount Tamalpais, Cal	33	6	6	25	n. 35 w.	33
Red Bluff, Cal	23	21	9	15	n. 72 w.	6
Sacramento, Cal	20	28	10	20	s. 51 w.	13
San Francisco, Cal	9	12	2	46	s. 86 w.	44
South Pacific Coast Region.						
Fresno, Cal	37	4	7	32	n. 37 w.	41
Los Angeles, Cal	6	21	1	46	s. 72 w.	47
San Diego, Cal	25	14	8	30	n. 64 w.	25
San Luis Obispo, Cal	28	11	3	26	n. 54 w.	29
West Indies.						
Basseterre, St. Kitts Island	8	8	50	1	e.	49
Bridgetown, Barbados	4	9	54	0	s. 85 e.	54
Havana, Cuba	24	8	39	10	n. 61 e.	33
Kingston, Jamaica	40	5	19	8	n. 17 e.	37
Port of Spain, Trinidad	1	4	54	1	s. 87 e.	53
San Juan, Porto Rico	1	27	44	4	s. 57 e.	48
Santiago de Cuba, Cuba	28	18	23	5	n. 61 e.	21
Willemstad, Curaçao	5	4	56	0	n. 90 e.	56

* From observations at 8 p. m only † From observations at 8 a. m. only.

TABLE VII.—*Thunderstorms and auroras, April, 1899.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	53	T.			4			2	1												1	1	1	5	6	2								23	9	T.
		A.																																0	0	A.
Arizona	53	T.			1	9	2							1		3		1																17	6	T.
		A.																																0	0	A.
Arkansas	57	T.		1	3										1	2				3	1	9	3		2				7		1	5		38	12	T.
		A.																																0	0	A.
California	189	T.																					2		1	3	2		1			1		10	6	T.
		A.																																0	0	A.
Colorado	73	T.	1	4			1							1	3	2										1	4					2		19	9	T.
		A.																																0	0	A.
Connecticut	22	T.													1	2											9	2				1		15	5	T.
		A.																																0	0	A.
Delaware	5	T.															2	1										2						5	3	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.																										1						1	1	T.
		A.																																0	0	A.
Florida	45	T.	5						6	1									3	4	1					4	7							31	8	T.
		A.																																0	0	A.
Georgia	54	T.				1			1								1							1	4	3	8							19	7	T.
		A.																																0	0	A.
Idaho	27	T.	1								1							1		1														4	4	T.
		A.																																0	0	A.
Illinois	92	T.			3										14	3	1			1	1	26	3	7	11	1	1		25		7	2		106	15	T.
		A.																																0	0	A.
Indiana	55	T.											2	4						3					1	2	2			8	2	3		27	9	T.
		A.		1																														1	1	A.
Indian Territory	8	T.														1				1		2												4	3	T.
		A.																																0	0	A.
Iowa	126	T.												1	17	1	1		8		25	9		2	1		1	13	42	1	16	34		172	15	T.
		A.																																0	0	A.
Kansas	74	T.	1		5				1		1				4	1			10	5	12	9		1			4	5	12	2	5	3		81	17	T.
		A.																																0	0	A.
Kentucky	45	T.																							2	4	3			5				14	4	T.
		A.																																0	0	A.
Louisiana	45	T.					2	6									4	2	1	1	1	9	6	2					1					35	11	T.
		A.																																0	0	A.
Maine	17	T.																																0	0	T.
		A.										1							1							1								3	3	A.
Maryland	39	T.														1	2	10								4	3	22				1		43	7	T.
		A.																																0	0	A.
Massachusetts	54	T.							1						2	4										3	22							32	5	T.
		A.																																0	0	A.
Michigan	107	T.	1									1	12	2	14	12	2			3	2		6	2	1	14	16	4	11	11	19	30		163	19	T.
		A.	1	1	1	1	1	1			3				1	1	1						1											13	11	A.
Minnesota	64	T.													9			1	5		2					1	13	15	2		15			63	9	T.
		A.						2			2													1										5	3	A.
Mississippi	42	T.	2		1	1			1								1		1	2	1	1	3											14	10	T.
		A.																																0	0	A.
Missouri	89	T.			11										8	4	1		6	7	11	23	6	14	1			5	28		3	12		140	15	T.
		A.																																0	0	A.
Montana	37	T.																3								2	3	3						11	4	T.
		A.										1	2			1					1									1	1			7	6	A.
Nebraska	145	T.														2					6	2					11	15	10		7	20		73	8	T.
		A.					1																											1	1	A.
Nevada	45	T.											1																					1	1	T.
		A.																																0	0	A.
New Hampshire	20	T.													1												8	1				2		12	4	T.
		A.				1							1						1															3	3	A.
New Jersey	50	T.												3				2									1	20				1		27	5	T.
		A.																												1				1	1	A.
New Mexico	38	T.					4					1				2	2	4	1															14	6	T.
		A.																																0	0	A.
New York	103	T.											11	7		10									1	6	24	1		1	9	27		97	10	T.
		A.										1																						1	1	A.
North Carolina	56	T.						1	11	2				2		1									1	2	17	6		1				44	10	T.
		A.																						1	1									2	2	A.
North Dakota	40	T.													1				1								3	9	1					15	5	T.
		A.						2	2				1								1									1		1		8	6	A.
Ohio	124	T.				1			1				5	31	1	15	3	1	1		1				4	36	12	3	5	41	1	2		164	18	T.
		A.			1	1											1														1	1		5	5	A.
Oklahoma	22	T.					1									2			1	5	1	4							1	1		1		17	9	T.
		A.																																0	0	A.
Oregon	71	T.																							2	1	2	1	5			1		12	6	T.
		A.																																0	0	A.
Pennsylvania	100	T.												2		1		2						2	4	3	14	16	3		1	10		58	11	T.
		A.																																0	0	A.
Rhode Island	8	T.														1											1	1						3	3	T.
		A.																																0	0	A.
South Carolina	44	T.	1						6								2								2	3	15	2						31	7	T.
		A.																																0	0	A.
South Dakota	52	T.														1					5	1					4	7	1			11		30	7	T.
		A.							1																									1	1	A.
Tennessee	61	T.			7	1														3	1			6	6	7	2			3	1	2		39	11	T.
		A.																																0	0	A.
Texas	83	T.					8									4	8	5		3		11	2					1		2	1			45	10	T.
		A.																																0	0	A.
Utah	34	T.	1															1									2		1	2	2	1		10	7	T.
		A.																																0	0	A.
Vermont	14	T.					1							1													3	1			1	5		12	6	T.
		A.																																0	0	A.
Virginia	47	T.				1			1									3								4	4	10	1	2				26	8	T.
		A.																																0	0	A.
Washington	55	T.	1		2												1							1					1			2		8	6	T.
		A.																																0	0	A.
West Virginia	38	T.												1			1	1							2	10	4	5		3	1	4		32	10	T.
		A.																																0	0	A.
Wisconsin	60	T.												1	12	4			2	2	1	1				1	1	6	29	4	15	18		97	14	T.
		A.				1					1																							2	2	A.
Wyoming	18	T.												1				2								1	4							8	4	T.
		A.	1				1				1																				1			4	4	A.
Sums	2,804	T.	14	5	37	14	19	9	30	3	2	2	31	58	88	79	32	40	40	44	73	108	32	48	52	118	230	177	187	87	107	201	....	1,962	....	T.
		A.	2	2	2	4	3	5	3	0	7	3	4	0	1	2	2	0	2	0	2	0	1	2	1	1	0	0	0	3	3	2	....	57	....	A.

TABLE VIII.—*Average hourly sunshine (in percentages), April, 1899.*

Stations.	Instrument.	A. M. 5	6	7	8	9	10	11	Noon	P. M. 1	2	3	4	5	6	7	8	Total. Actual.	Possible.	Percent of possible.	Personal estimate.
																		Hours.	*Hours.*		
Albany, N. Y	T.	14	40	49	64	72	74	79	79	82	82	76	65	58	46	29	......	262.0	402.1	65	54
Atlanta, Ga	T.	......	48	47	48	63	70	72	75	78	73	67	59	47	37	41	......	234.3	391.6	60	50
Atlantic City, N. J	P.	......	75	72	72	77	71	71	71	72	77	73	72	69	67	66	......	285.5	397.0	72	57
Baltimore, Md	T.	......	52	69	80	87	93	95	96	92	92	95	90	84	66	55	......	331.9	397.0	84	64
Binghamton, N. Y	T.	71	47	53	72	68	80	84	83	81	81	80	77	63	40	34	......	275.2	401.1	69	51
Bismarck, N. Dak	P.	36	52	57	69	69	71	74	67	60	72	67	59	54	51	39	0	252.8	408.4	62	59
Boise, Idaho	P.	33	32	38	52	50	54	59	58	38	59	61	56	54	42	33	25	200.6	403.6	50	39
Boston, Mass	T.	0	58	65	69	77	85	82	85	86	87	76	70	65	56	48	......	292.4	401.1	73	66
Buffalo, N. Y	T.	14	35	52	60	66	72	78	85	88	90	87	73	71	52	25	......	274.4	402.1	68	39
Charleston, S. C	T.	......	51	49	51	59	65	51	63	59	74	72	57	49	34	31	......	217.6	390.5	56	52
Chattanooga, Tenn	T.	......	44	43	43	51	66	71	72	73	69	62	62	45	30	28	......	217.7	392.7	55	44
Cheyenne, Wyo	P.	0	67	74	84	81	82	78	78	86	88	84	75	70	69	42	......	305.9	399.4	77	53
Chicago, Ill	T.	29	51	52	55	67	73	81	84	82	84	76	67	50	39	36	......	261.0	401.1	65	58
Cincinnati, Ohio	T.	......	34	35	45	64	73	81	79	80	82	82	72	66	56	52	......	260.4	397.0	66	47
Cleveland, Ohio	T.	100	57	59	56	63	72	78	78	76	78	75	70	60	54	53	......	268.6	401.1	67	56
Columbia, Mo	T.	......	46	49	57	70	77	77	79	81	75	72	71	68	60	53	......	269.7	397.0	68	41
Columbus, Ohio	T.	......	66	64	66	71	79	85	88	85	83	80	70	59	59	50	......	290.1	398.6	73	49
Denver, Colo	P.	......	66	76	80	84	85	87	91	90	92	89	91	86	77	76	......	335.9	398.6	84	68
Des Moines, Iowa	T.	0	42	43	50	55	62	70	75	62	58	60	49	45	35	35	......	215.0	401.1	54	49
Detroit, Mich	T.	29	42	39	59	73	78	79	85	83	78	75	68	60	46	45	......	264.9	401.1	66	49
Dodge, Kans	P.	......	45	55	79	85	84	79	78	86	82	81	78	76	72	68	......	300.9	396.2	76	61
Dubuque, Iowa	T.	29	65	60	60	76	80	82	88	83	81	65	56	43	42	44	....	266.8	401.1	67	56
Eastport, Me	P.	60	65	67	77	74	78	79	77	81	79	80	76	72	68	63	30	301.3	405.2	74	55
Eikins, W. Va	T.	......	7	8	36	55	69	70	66	65	72	55	44	29	11	9	.....	177.1	397.0	45	37
Erie, Pa	T.	0	47	44	46	62	70	73	80	81	83	80	71	64	64	65	......	268.6	401.1	67	48
Escanaba, Mich	T.	25	24	30	31	44	58	57	59	60	54	47	39	21	5	4	25	158.1	407.0	39	39
Eureka, Cal	P.	0	30	34	41	48	69	72	68	64	70	71	71	63	50	45	...	230.9	399.4	58	50
Fresno, Cal	T.	......	83	80	82	87	96	95	98	96	87	87	86	81	60	48	......	333.1	394.8	84	73
Galveston, Tex	P.	......	28	39	51	53	60	65	58	66	64	70	68	59	44	23	.....	215.6	386.4	56	46
Grand Junction, Colo	P.	......	75	76	74	83	86	82	77	77	77	81	77	73	65	72	......	305.9	397.0	77	61
Harrisburg, Pa	T.	......	59	60	55	68	74	83	85	86	85	80	77	72	58	54	.....	286.8	398.6	72	52
Helena, Mont	P.	27	26	39	47	50	60	63	57	61	59	63	65	55	50	42	29	217.4	408.4	53	44
Huron, S. Dak	T.	67	47	43	43	63	73	73	73	72	70	65	72	61	62	60	25	254.8	403.6	63	54
Idaho Falls, Idaho	T.	36	37	43	57	60	69	73	75	76	68	62	61	46	31	21	......	228.1	402.1	57	45
Indianapolis, Ind	T.	......	39	37	52	69	74	76	75	73	76	67	58	44	37	41	......	236.4	398.6	59	44
Jacksonville, Fla	T.	......	62	57	63	69	75	82	86	87	85	79	71	65	38	27	......	269.1	387.4	69	57
Kansas City, Mo	P.	......	55	57	57	59	58	61	55	49	58	52	52	53	49	55	......	218.5	397.0	55	48
Key West, Fla	T.	......	59	54	68	82	90	87	84	83	83	87	82	68	34	29	......	280.6	382.5	73	57
Knoxville, Tenn	T.	......	25	34	48	75	83	88	86	83	81	79	77	67	46	34	......	263.7	393.6	67	61
Lexington, Ky	T.	......	27	32	57	65	75	81	77	79	75	78	72	63	41	27	......	248.0	396.2	63	46
Little Rock, Ark	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	51
Los Angeles, Cal	P.	......	39	41	49	54	60	71	82	93	96	95	92	87	82	75	.....	288.9	391.6	74	57
Louisville, Ky	T.	......	43	46	48	56	65	74	72	75	73	68	63	54	40	31	......	233.7	396.2	59	43
Meridian, Miss	T.	.....	40	44	64	79	85	88	91	91	83	83	79	74	56	43	......	288.4	389.9	74	50
Minneapolis, Minn	T.	50	40	46	56	63	77	76	72	72	64	59	57	50	36	32	30	234.9	405.2	58	......
Mount Tamalpais, Cal	P.	......	21	50	78	77	76	76	80	86	85	89	91	89	83	48	......	300.7	396.2	76	53
Nashville, Tenn	T.	......	37	36	51	65	73	70	76	74	73	71	64	56	37	26	......	234.1	393.6	59	44
New Orleans, La	T.	......	51	54	56	63	73	70	67	72	66	62	59	60	63	66	......	245.7	387.4	63	57
New York, N. Y	T.	0	36	45	65	81	84	88	86	79	76	74	70	63	48	43	......	273.5	399.4	68	56
Northfield, Vt	P.	33	42	54	57	63	62	66	68	56	59	62	64	54	41	32	0	228.3	403.6	57	46
Oklahoma, Okla	T.	......	43	42	45	54	64	65	66	72	71	71	68	60	47	49	......	232.6	392.7	59	52
Omaha, Nebr	P.	0	35	45	59	61	63	65	61	64	65	69	62	57	51	45	......	232.6	399.4	58	37
Parkersburg, W. Va	T.	......	20	20	27	44	51	64	66	71	70	64	56	39	26	26	......	188.3	397.0	47	45
Phenix, Ariz	P.	......	79	71	80	87	87	85	85	86	87	87	86	82	79	74	......	324.5	390.5	83	72
Philadelphia, Pa	T.	......	75	72	68	77	82	87	88	94	89	78	73	74	72	65	......	312.7	398.6	78	56
Pittsburg, Pa	T.	0	16	13	18	19	29	46	55	50	49	50	42	28	20	21	.....	132.8	399.4	33	48
Portland, Me	T.	33	50	70	80	86	95	94	94	93	91	85	81	77	70	57	0	327.8	403.6	81	65
Portland, Oreg	T.	0	5	9	20	41	49	62	62	52	65	49	43	39	39	34	0	167.9	407.0	41	36
Raleigh, N. C	T.	......	34	34	37	46	61	77	74	77	73	68	61	52	45	37	......	223.4	393.6	57	51
Rochester, N. Y	T.	14	43	43	56	59	63	70	72	70	64	69	61	48	42	40	......	232.6	402.1	58	54
St. Louis, Mo	T.	......	38	42	59	67	74	78	76	81	80	81	68	64	45	40	......	259.2	397.0	65	47
St. Paul, Minn	P.	60	57	59	66	70	79	74	69	67	63	65	60	68	58	63	50	266.5	405.2	66	56
Salt Lake City, Utah	P.	0	56	62	74	83	79	75	73	59	66	73	60	61	49	52	......	265.7	399.4	67	54
San Diego, Cal	P.	......	40	37	40	54	70	89	86	90	91	86	84	84	64	57	......	277.6	390.5	71	72
San Francisco, Cal	T.	......	51	53	60	79	82	91	96	93	95	96	99	96	81	67	......	327.7	396.2	83	70
Santa Fe, N. Mex	P.	......	74	75	89	95	98	92	85	86	87	81	81	72	69	71	......	325.5	393.6	83	75
Savannah, Ga	T.	......	69	62	65	69	75	82	80	79	77	72	60	56	46	49	......	264.7	389.9	68	56
Seattle, Wash	T.	7	9	16	37	50	61	68	73	70	75	57	51	39	21	9	5	189.7	410.4	46	37
Spokane, Wash	T.	0	11	30	48	69	76	80	79	76	67	71	68	60	39	17	0	236.1	410.4	58	38
Tacoma, Wash	T.	9	31	30	41	54	72	83	79	85	82	75	65	53	39	44	57	245.6	408.4	60	29
Tampa, Fla	T.	......	38	37	37	44	60	58	64	73	71	70	62	47	40	39	......	208.9	385.4	54	50
Topeka, Kans	T.	......	38	42	46	52	58	62	73	79	75	75	74	63	50	49	......	240.9	397.0	61	47
Vicksburg, Miss	T.	.....	26	30	41	58	72	73	76	78	80	73	58	50	38	29	......	226.2	389.9	58	54
Washington, D. C	P.	......	64	58	66	78	86	88	86	81	83	82	79	76	74	75	......	307.0	397.0	77	64
Wilmington, N. C	T.	......	30	37	57	76	71	74	81	70	70	64	64	51	34	30	......	234.2	391.6	60	46
Yankton, S. Dak	T.	50	44	51	64	74	77	79	76	79	76	78	79	71	64	49	......	279.3	402.1	69	53
Basseterre, St. Kitts	T.	......	29	30	34	62	80	89	91	89	88	84	67	39	10	10	......	232.0	376.2	62	50
Bridgetown, Barbados	T.	......	50	53	57	64	76	70	64	66	62	63	53	44	31	24	......	216.2	373.1	58	38
Colon, United States of Columbia	T.	......	41	33	53	72	88	93	94	89	85	78	78	53	34	33	......	259.1	370.1	70	43
Havana, Cuba	T.	......	44	43	38	48	64	69	75	84	82	73	67	45	47	50	......	231.0	381.5	61	61
Kingston, Jamaica, W. I	T.	......	69	78	86	85	78	74	85	84	70	58	40	34	37	21	......	251.7	376.9	67	49
Port of Spain, Trinidad, W. I	T.	......	83	84	90	93	92	92	95	92	91	91	78	70	64	60	......	317.6	371.6	85	57
San Juan, Porto Rico	T.	......	13	29	65	79	83	88	87	89	90	76	66	61	31	0	......	254.6	376.9	68	66
Santiago de Cuba, Cuba	T.	......	90	90	87	81	78	85	87	88	81	84	75	57	55	34	......	296.0	378.3	78	62
Santo Domingo, Santo Domingo	T.	......	56	61	58	59	64	65	75	75	70	70	55	50	44	44	.....	232.3	376.9	62	58
Willemstad, Curaçao	T.	......	40	56	90	97	100	100	100	100	100	100	100	95	71	40	......	337.9	372.6	91	68

TABLE IX.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during April, 1899, at all stations furnished with self-registering gauges.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	25			0.36														0.12			
Atlanta, Ga.	3-4			0.63														0.20			
Atlantic City, N. J.	7			0.99														0.23			
Baltimore, Md.	7			1.00														0.24			
Binghamton, N. Y.	7			0.40														0.14			
Bismarck, N. Dak.	19-20			0.84														*			
Boise, Idaho	30			0.40														0.15			
Boston, Mass.	7-8			0.78														0.13			
Buffalo, N. Y.	7-8			0.72														*			
Cairo, Ill.	6-7			0.57														0.10			
Charleston, S. C.	25			0.64														0.58			
Chicago, Ill.	20			0.06														*			
Cincinnati, Ohio	24			0.33														0.19			
Cleveland, Ohio	12			0.24														0.19			
Columbia, Mo.	22			0.82														0.49			
Columbus, Ohio	7			0.52														0.06			
Denver, Colo.	5			0.35														0.08			
Des Moines, Iowa	27			0.80														0.53			
Detroit, Mich.	19			0.17														0.13			
Dodge, Kans	25			0.28														0.26			
Duluth, Minn.	26-27			0.78														*			
Eastport, Me.	8			0.64														0.13			
Elkins, W. Va.	14			0.50														0.49			
Erie, Pa.	7-8			0.54														*			
Escanaba, Mich.	27-28			1.20														0.50			
Fort Worth, Tex.	15			1.71														0.63			
Fresno, Cal.	25-26			0.31														0.20			
Galveston, Tex.	5-6	2.08 p.m.	6.59 a.m.	1.56	1.52 a.m.	3.05 a.m.	0.06	0.23	0.42	0.46	0.48	0.48	0.49	0.52	0.55	0.57	0.61	0.84	1.12	1.17	1.26
Grand Junction, Colo.	29-30			0.84														*			
Hannibal, Mo.	22			0.58														0.20			
Harrisburg, Pa.	7			0.79														0.18			
Hatteras, N. C.	7	10.25 p.m.	11.30 p.m.	0.78	10.30 p.m.	11.05 p.m.	0.03	0.09	0.17	0.27	0.36	0.52	0.62	0.71							
Huron, S. Dak.	30			0.64														*			
Idaho Falls, Idaho	16			0.08														0.02			
Indianapolis, Ind.	24			0.51														0.13			
Jacksonville, Fla.	18			2.60														0.35			
Jupiter, Fla.	7	4.00 p.m.	5.00 p.m.	0.67	4 28 p.m.	4.53 p.m.	0.05	0.25	0.39	0.45	0.53	0.60									
Kansas City, Mo.	19-20	9.20 p.m.	3.15 a.m.	1.02	9.25 p.m.	9.50 p.m.	T.	0.05	0.30	0.44	0.45	0.50									
Key West, Fla.	17-18			1.37														0.51			
Knoxville, Tenn	3-4			1.07														0.22			
Lexington	24			0.51														0.34			
Lincoln, Nebr.	26			0.65														0.60			
Little Rock, Ark	20	3.20 p.m.	4.00 p.m.	0.69	3.20 p.m.	3.55 p.m.	0.00	0.09	0.33	0.43	0.52	0.58	0.63	0.68							
Los Angeles, Cal.	26			0.10														0.04			
Louisville, Ky.	24			1.34														0.55			
Macon	25	1.21 a.m.	4.08 a.m.	0.79	3.39 a.m.	4.01 a.m.	0.13	0.08	0.16	0.33	0.61	0.66									
Memphis, Tenn.	6-7			0.56														0.18			
Meridian, Miss	6			0.72														0.15			
Milwaukee, Wis.	13-14			0.18													0.18				
Montgomery, Ala.	23			0.91														0.49			
Nantucket, Mass.	7-8			0.69														0.24			
Nashville, Tenn.	23			0.79														*			
New Orleans, La.	21			0.97														0.33			
New York, N. Y.	7-8			0.94														0.16			
Norfolk, Va.	7			1.09														0.49			
Northfield, Vt.	7-8			0.69														*			
Oklahoma, Okla.	20-22			3.05														0.33			
Omaha, Nebr.	30			0.34														0.34			
Parkersburg, W. Va.	28			0.42														0.42			
Philadelphia, Pa.	7			0.65														0.10			
Pittsburg, Pa.	7-8			1.27														*			
Portland, Me.	7-8			1.09														0.21			
Portland, Oreg.	11-12			0.95														0.19			
Raleigh, N. C.	7	6.10 a.m.	8.20 p.m.	2.50	4.35 p.m.	5.45 p.m.	0.72	0.10	0.18	0.24	0.34	0.45	0.53	0.64	0.79	0.98	1.01	1.08	1.26		
Richmond, Va.	7			1.52														0.66			
Rochester, N. Y.	30			0.28							0.28										
St. Louis, Mo.	22-23			0.60														0.18			
St. Paul, Minn.	30			0.90														0.43			
Salt Lake City, Utah	2			0.42														0.19			
San Diego, Cal.	26			0.28														0.25			
San Francisco, Cal.	24			0.39														0.15			
Savannah, Ga.	4			0.25									0.23								
Seattle, Wash.	11			1.28														0.22			
Spokane, Wash.	3			0.42														0.26			
Tampa, Fla.	7	7.43 a.m.	1.20 p.m.	1.25	7.45 a.m.	8.10 a.m.	T.	0.20	0.53	0.60	0.70	0.75									
Vicksburg, Miss.	6			1.12														0.20			
Washington, D. C.	7			0.93														0.31			
Wilmington, N. C.	25-26	8.10 p.m.	2.10 a.m.	1.02	9.10 p.m.	9.35 p.m.	0.04	0.03	0.12	0.26	0.48	0.55	0.58								
Yankton, S. Dak.	30			0.21														0.17			
Basseterre, St. Kitts	24	D. N.	8.23 a.m.	2.08	5.40 a.m.	6.25 a.m.	0.36	0.07	0.15	0.27	0.50	0.62	0.80	0.90	0.97	1.00					
					7.30 a.m.	8.05 a.m.		0.10	0.20	0.35	0.46	0.52	0.60	0.65							
Bridgetown, Barbados	4			0.26										0.26							
Colon, U. S. C.	25-26			0.21									0.12								
Havana, Cuba	18			0.69														0.33			
Kingston, Jamaica	14	11.56 a.m.	3.56 p.m.	0.69	1.30 p.m.	1.55 p.m.	0.03	0.03	0.18	0.29	0.41	0.47									
Port of Spain, Trin.	5			0.27										0.27							
San Juan, Porto Rico	24-25	5.26 p.m.	4.45 p.m.	4.34	3.55 a.m.	4.40 a.m.	1.62	0.06	0.14	0.18	0.20	0.26	0.39	0.51	0.61	0.65					
					6.30 a.m.	7.20 a.m.	2.90	0.13	0.21	0.33	0.45	0.54	0.58	0.64	0.69	0.72	0.77	0.79			
Santiago de Cuba	14			0.25									0.25								
Santo Domingo	29	1.00 a.m.	8.30 a.m.	4.42	3.25 a.m.	4.15 a.m.	0.02	0.11	0.17	0.27	0.48	0.65	0.91	1.07	1.33	1.67	1.76				
					4.15 a.m.	5.05 a.m.		1.79	1.95	2.31	2.65	2.89	3.03	3.22	3.47	3.58	3.69				
					5.05 a.m.	5.40 a.m.		3.75	3.76	3.78	3.93	4.08	4.17	4.20	4.21	4.22	4.23	4.25			
Do	29	11.20 a.m.	10.40 p.m.	1.78	3.00 p.m.	3.15 p.m.	0.15	0.18	0.73	0.98	1.01	1.01	1.02	1.02	1.10	1.12					
Willemstad, Curaçao	12			0.04							0.04										

* Record incomplete on account of snow or other causes.

TABLE X.—*Excessive precipitation, by stations, for April, 1899.*

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
	Inches.	*Inches.*		*Ins.*	*h. m.*	
Alabama.						
Union Springs		5.50	23	5.50	5 00	23
Arkansas						
Mount Nebo		2.54	21-22			
Florida.						
Federal Point		4.36	17-18			
Jacksonville		2.60	18			
Lemon City	10.75	6.85	7-8			
Orange Park		7.15	17-18			
Plant City		2.67	17-18			
St. Francis Barracks		4.25	17-18			
Switzerland		6.11	17-18			
Georgia.						
Gainesville				1.27	0 15	25
Marshallville				2.00	1 00	24
Iowa.						
Lansing		3.00	28			
Kansas.						
Independence		3.19	13-14			
Louisiana.						
Jeanerette		4.30	4-5			
Do		2.75	20			
New Iberia		3.50	20	2.00	1 20	20
Port Eads		2.51	21			
Rayne				1.05	1 00	20
Robeline		3.30	5-6			
Michigan.						
Ewen		3.00	27			
Mississippi.						
Americus		2.50	6-7			
Missouri.						
Birchtree		3.76	20-21			
Edgehill		2.68	20-21			
Houston		2.50	21			
Kidder				1.10	0 18	27
Oakfield		3.07	20	2.03	0 40	20
Olden		3.98	21-22			
Shelbina		2.50	27			
North Carolina.						
Flatrock		2.58	7			

TABLE X.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
	Inches.	*Inches.*		*Ins.*	*h. m.*	
North Carolina—Continued.						
Patterson		2.85	25			
Raleigh		2.50	7	1.08	1 00	7
Sloan		2.54	18-19			
Southport		5.32	18-19			
Oregon.						
Astoria		3.16	10-11			
Bay City	14.99	4.04	11			
Cascade Locks	11.65					
Glenora	16.81	5.44	11			
Government Camp	12.70					
Nenalem	15.55	5.68	10-11			
Tennessee.						
Chattanooga		3.96	22-23			
Tullahoma		2.50	22-23			
Texas.						
Arthur		2.80	22			
Brazoria		2.68	20			
Conroe				2.20	1 00	21
Dallas		3.61	14-15			
Runge		4.31	15-16	1.38	1 00	16
Washington.						
Cedar Lake	12.77	2.50	11			
Clearwater	14.01					
Monte Cristo	10.87	3.00	12			
Neah	11.27					
Northbend	10.96	3.10	11			
Snoqualmie		3.60	11			
Southbend	11.75	4.20	11			
Union City		3.16	11			
Vashon		2.55	11			
Wisconsin.						
Harvey				1.78	1 10	27
West Indies.						
Basseterre, St. Kitts				1.03	0 55	24
San German, Porto Rico	12.94					
San Juan, Porto Rico		4.34	24-25			
Santo Domingo, S. D	10.26	6.20	29	4.20	2 10	29
Do				1.01	0 17	29

TABLE XI.—*Data furnished by the Canadian Meteorological Service, April, 1899.*

Stations.	Pressure. Mean not reduced.	Mean reduced.	Departure from normal.	Temperature. Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Precipitation. Total.	Departure from normal.	Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.68	29.83	—.06	34.9	+ 0.4	40.3	29.5	3.88		0.7
Sydney, C. B. I	29.90	29.94	+.07	37.8	+ 2.8	45.8	29.9	2.75	—1.05	0.5
Halifax, N. S	29.86	29.97	+.09	42.2	+ 4.4	52.4	32.1	3.29	—0.02	3.7
Grand Manan, N. B	29.94	29.99		41.4	+ 2.2	49.5	33.2	1.23	—2.17	T.
Yarmouth, N. S	29.93	30.01	+.10	40.9	+ 2.0	49 0	32.7	2.23	-0.71	1.2
Charlottet'n, P. E. I	29.93	29.97	+ 01	38.5	+ 3.3	46.9	30.1	2.22	—0.70	1.6
Chatham, N. B	29.97	29.99	+.07	38.6	+ 3.1	49.7	27.5	0.86	—2.24	2.7
Father Point, Que	29.98	30.00	+.08	33.9	+ 0.7	43.3	24.6	1.02	—1.00	3.6
Quebec, Que	29.68	30.02	+.07	38.7	+ 3.6	47.8	29.6	0.82	—1.57	4.8
Montreal, Que	29.81	30.02	+.06	42.9	+ 3.2	50.9	34.9	1.63	—0.81	1.9
Bissett, Ont	29.42	30.04		40.5		53.5	27.5	0.44		1.0
Ottawa, Ont				42.2	+ 2.2	52.3	32.2	1.08		T.
Kingston, Ont	29.72	30.04	+.07	43.7	+ 3.7	52.7	34.6	1.07	—0.88	0.4
Toronto, Ont	29.67	30.06	+.07	44.9	+ 4.1	53.7	36.2	1.62	—0.26	1.8
White River, Ont	28.64	30.02	—.05	34.6	+ 1.6	46.8	22.4	2.40	+1.22	2.6
Port Stanley, Ont	29.39	30.04	+.04	44.6	+ 3.6	53.0	36.2	0.53	—1.60	0.8
Saugeen, Ont	29.31	30.04	+.04	43.2	+ 4.5	53.3	33.1	1.59	—0.24	2.1
Parry Sound, Ont	29.33	30.04	+.06	42.4	+ 4.8	54.0	30.9	1.25	—0.47	0.2
Port Arthur, Ont	29.25	29.96	—.07	36.3	+ 2.8	44.6	27.9	2.57	+1.20	T.
Winnipeg, Man	29.11	29.96	—.08	36.7	+ 0.8	48.4	25.1	2.17	+0.82	4.5
Minnedosa, Man	28.10	29.96	—.03	32.9	— 3.1	44.9	20.9	0.57	—0.55	3.5
Qu'Appelle, Assin	27.63	29.94	—.03	32.0	— 5.4	43.5	20.4	0.46	—0.60	2.6
Medicine Hat, Assin	27.58	29.91	—.02	38.3	— 6.2	51.2	25.5	0.87	+0.36	8.0
Swift Current, Assin	27.32	29.95	—.06	36.2	— 5.1	46.9	25.5	0.25	—0.93	1.7
Calgary, Alberta	26.28	29.88	—.05	33.8	— 5.8	46.8	20.8	0.40	—0.22	3.0
Banff, Alberta	25.22	29.95		32.6		42.7	22.6	1.22		9.6
Edmonton, Alberta	27.53	29.87	—.06	36.8	— 3.1	48.2	25.4	1.70	+1.13	14.0
Prince Albert, Sask	28.31	29.89		31.3	— 4.8	43.3	19.2	1.03		5.9
Battleford, Sask	28.16	29.94		32.6	— 4.6	44.2	21.1	0.70		4.0
Kamloops, B. C	28.60	29.89		46.8		57.5	36.0	0.06		0.0
Esquimalt, B. C	29.97	30.00		47.0	+ 0.5	53.9	40.0	2.88		0.0
Hamilton, Bermuda	29.86	30.02	.00	63.5	— 0.4	68.8	58.2	5.89		

Chart I. Tracks of Centers of High Areas. April, 1899.

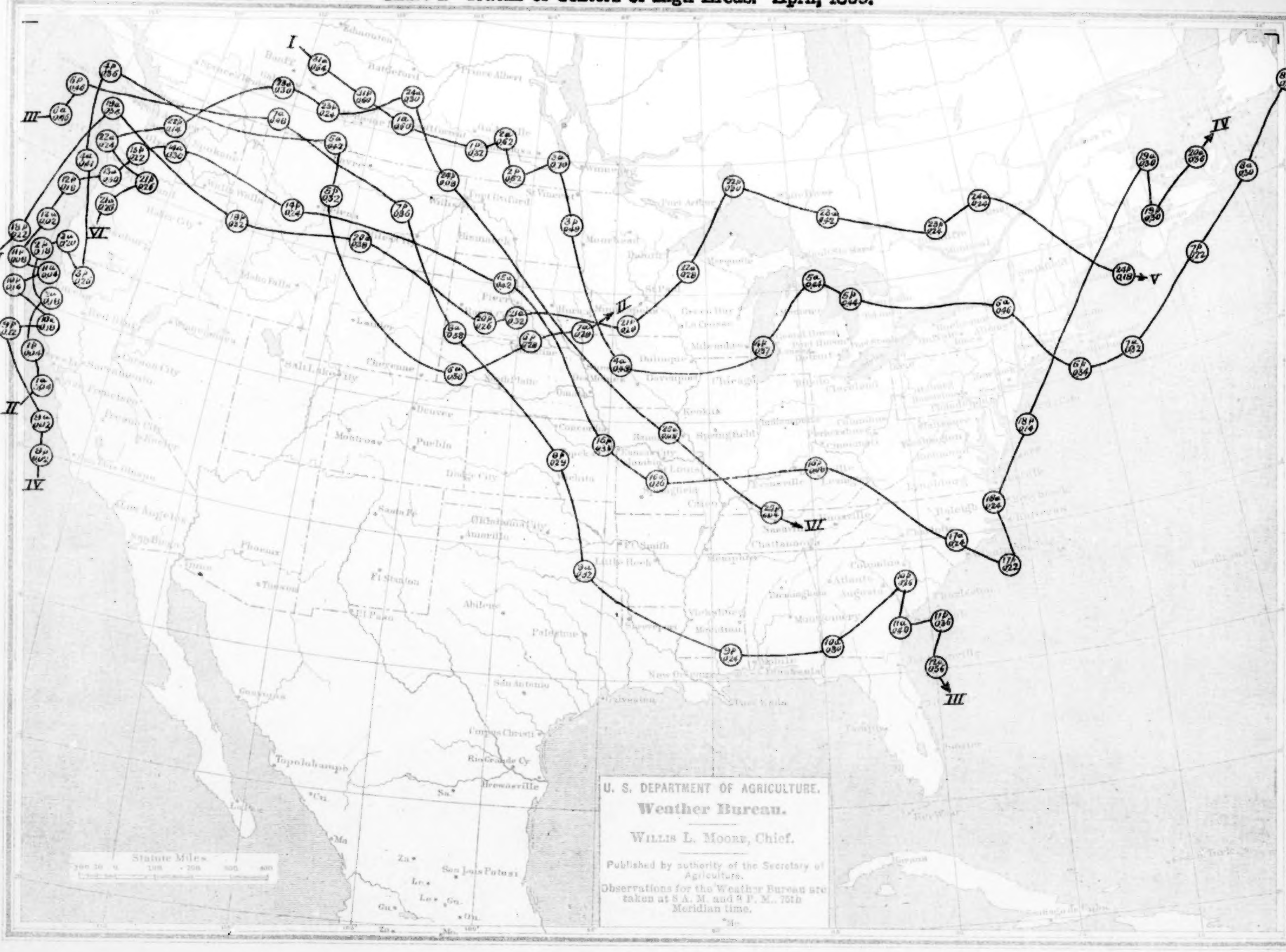


Chart II. Tracks of Centers of Low Areas. April, 1899.

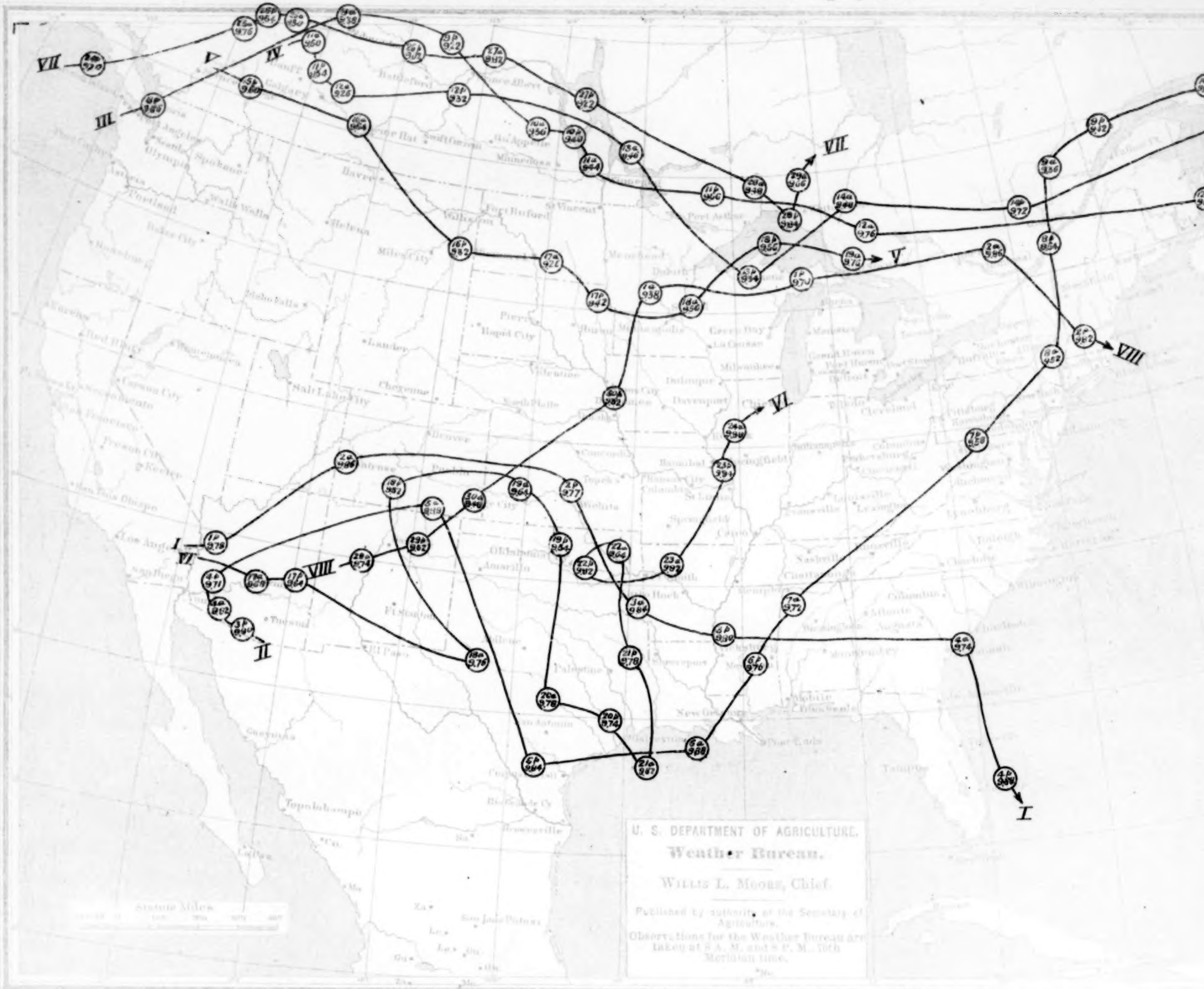


Chart III. Total Precipitation. April, 1899.

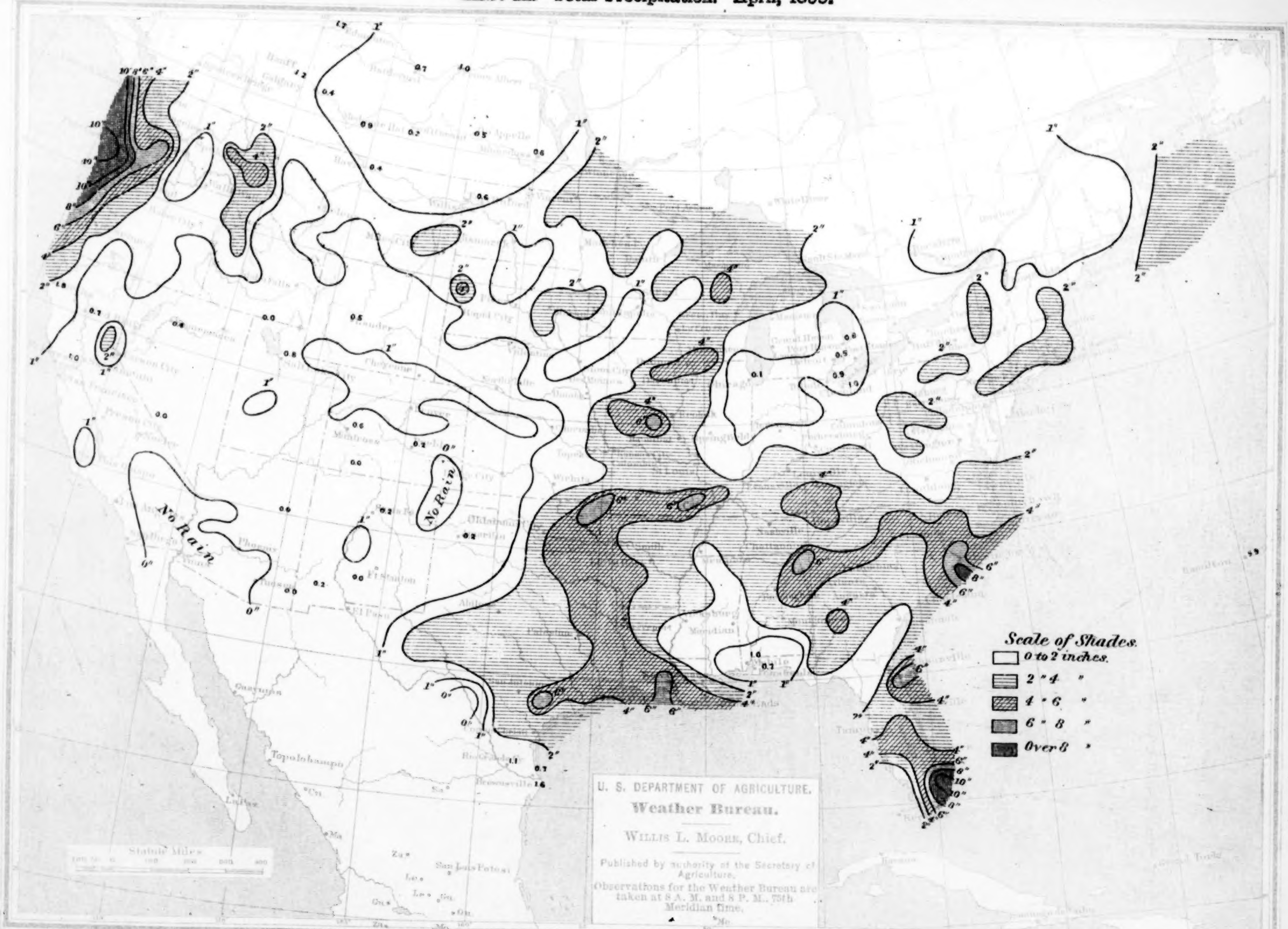
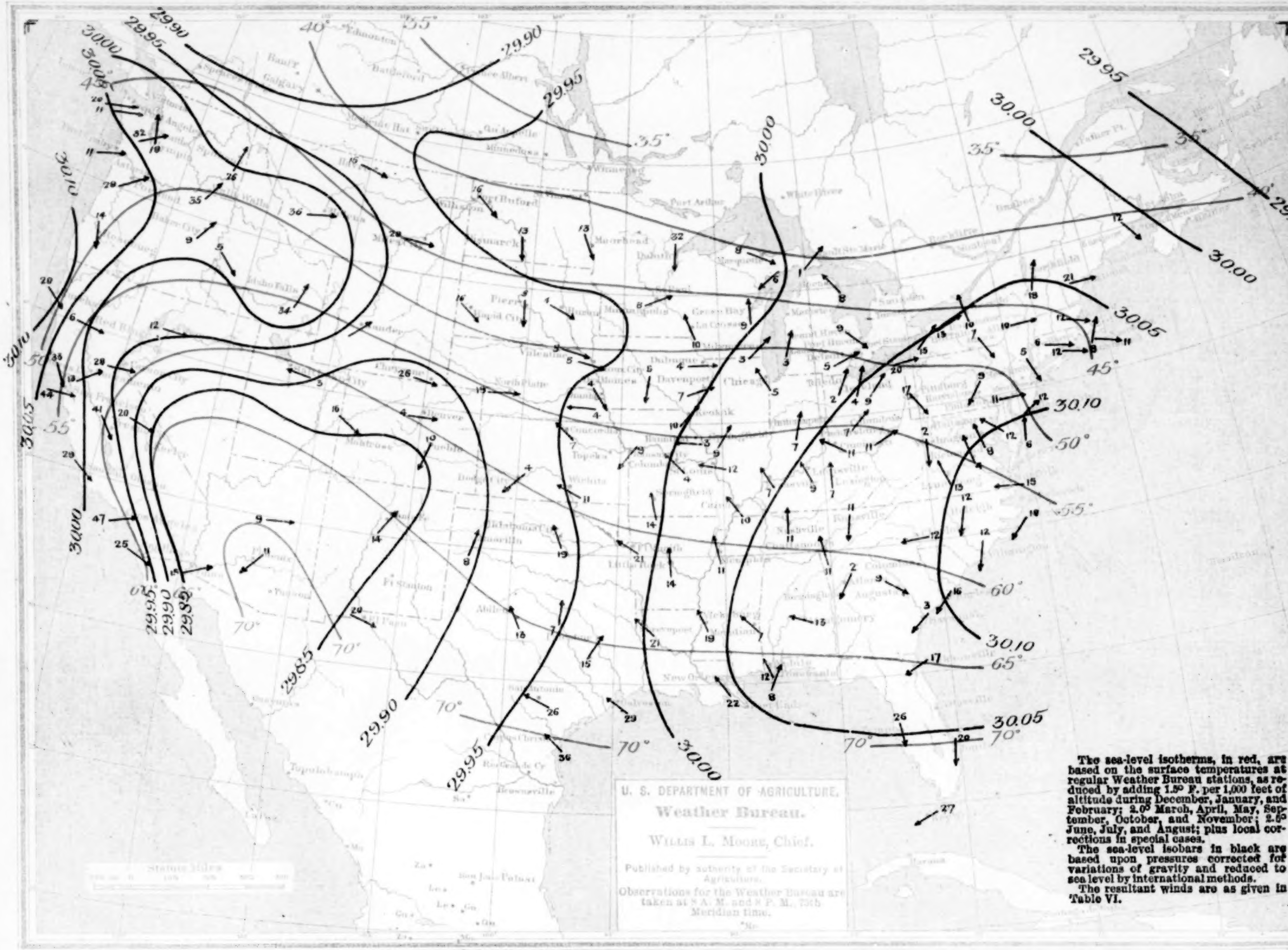


Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. April, 1899.



The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 1.5° F. per 1,000 feet of altitude during December, January, and February; 2.0° March, April, May, September, October, and November; 2.5° June, July, and August; plus local corrections in special cases.

The sea-level isobars in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods.

The resultant winds are as given in Table VI.

Chart V. Hydrographs for Seven Principal Rivers of the United States. April, 1899.

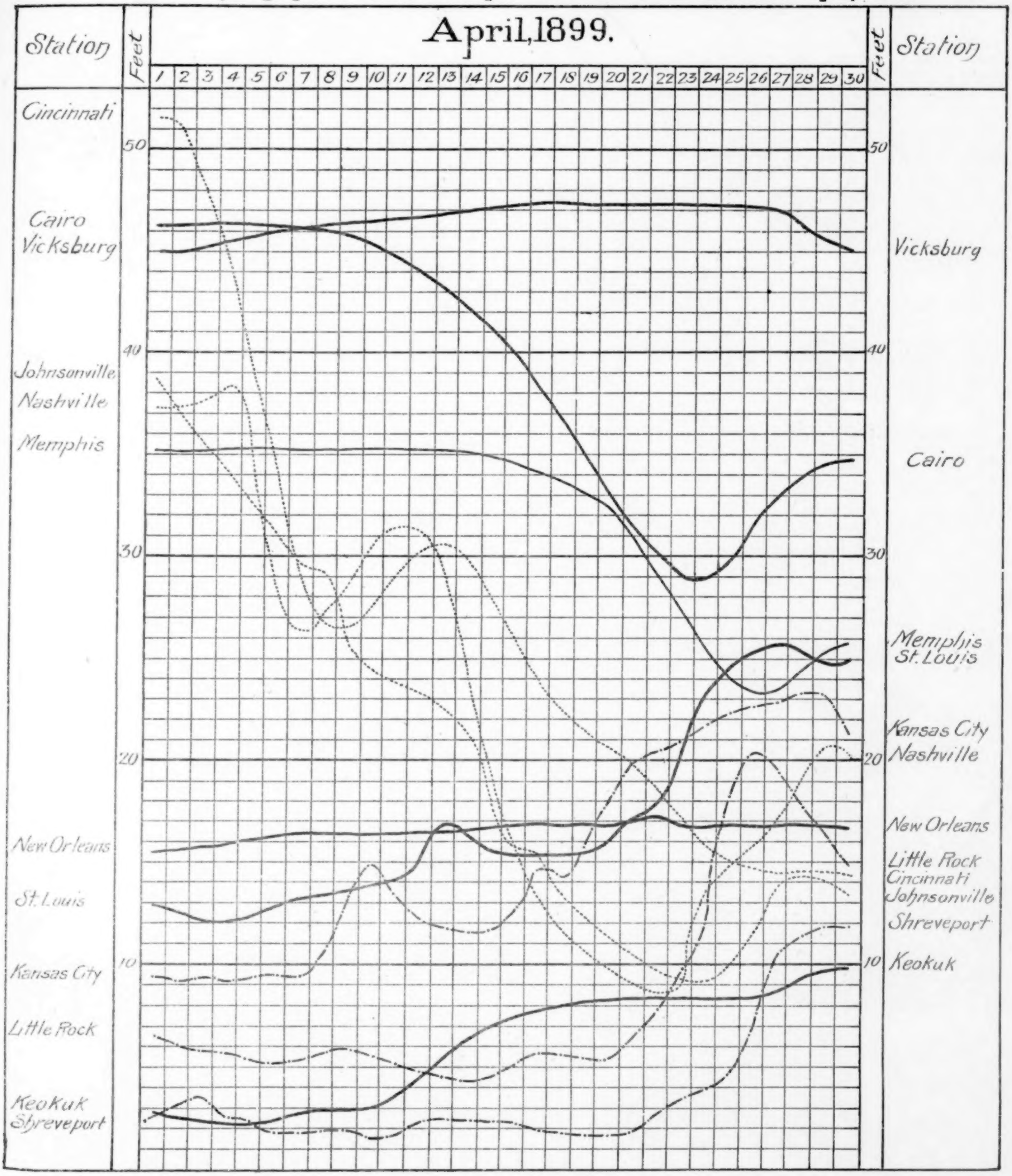


Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. April, 1899.

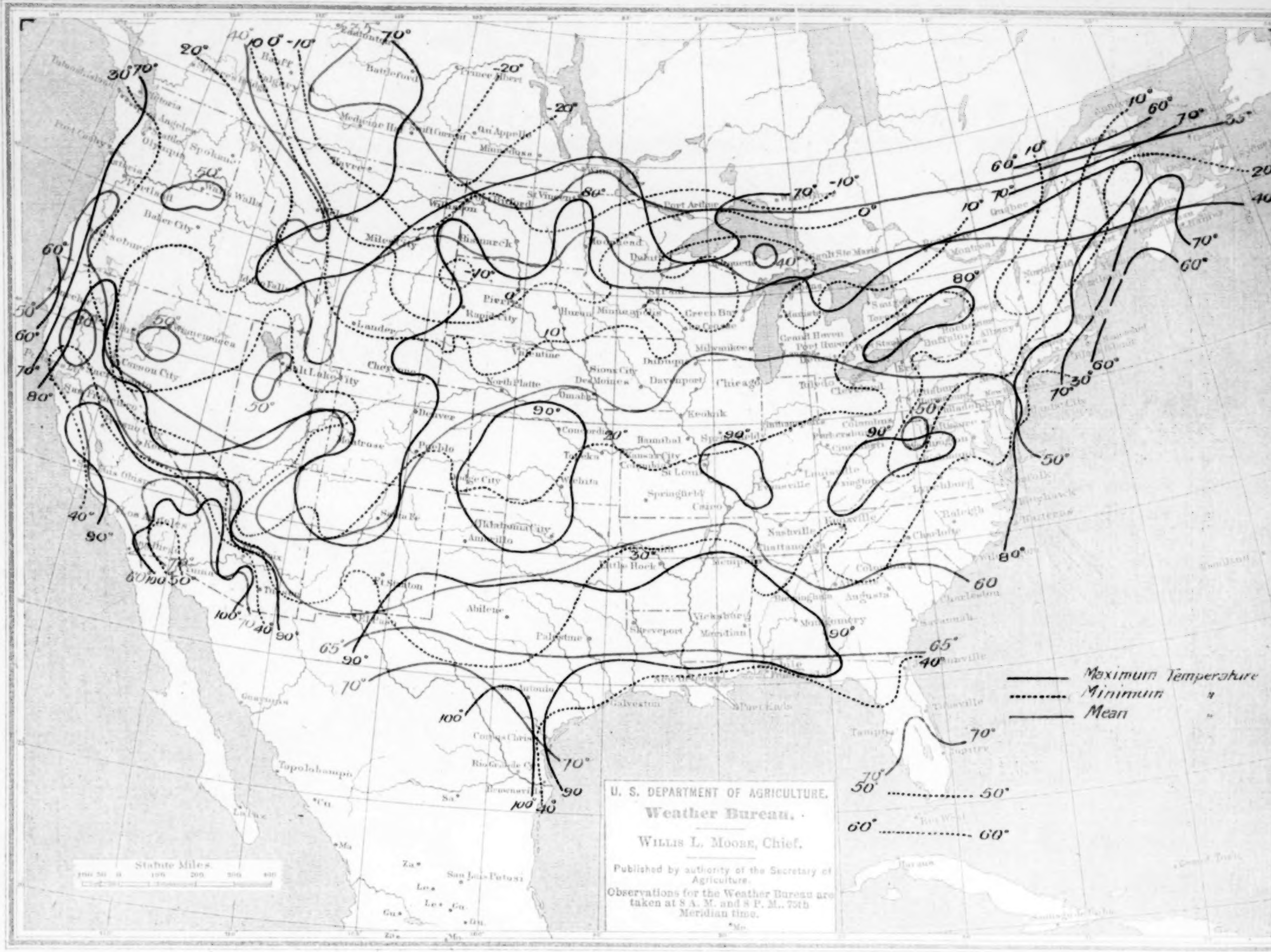


Chart VII. Percentage of Sunshine. April, 1899.

Chart VIII. Total Snowfall. April, 1899.

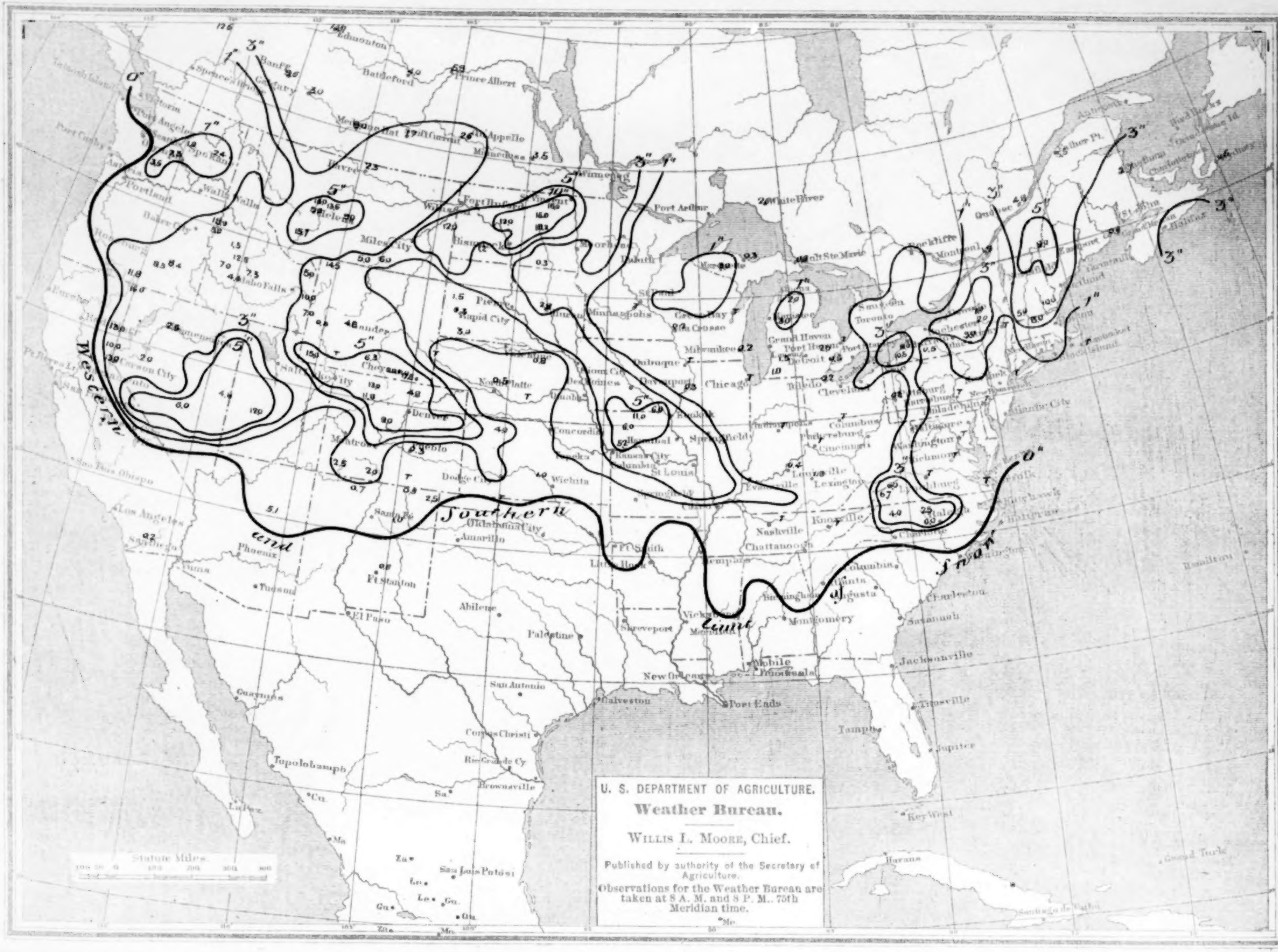


Chart IX. West Indian Monthly Isobars, Isotherms, and Resultant Winds. March, 1899.

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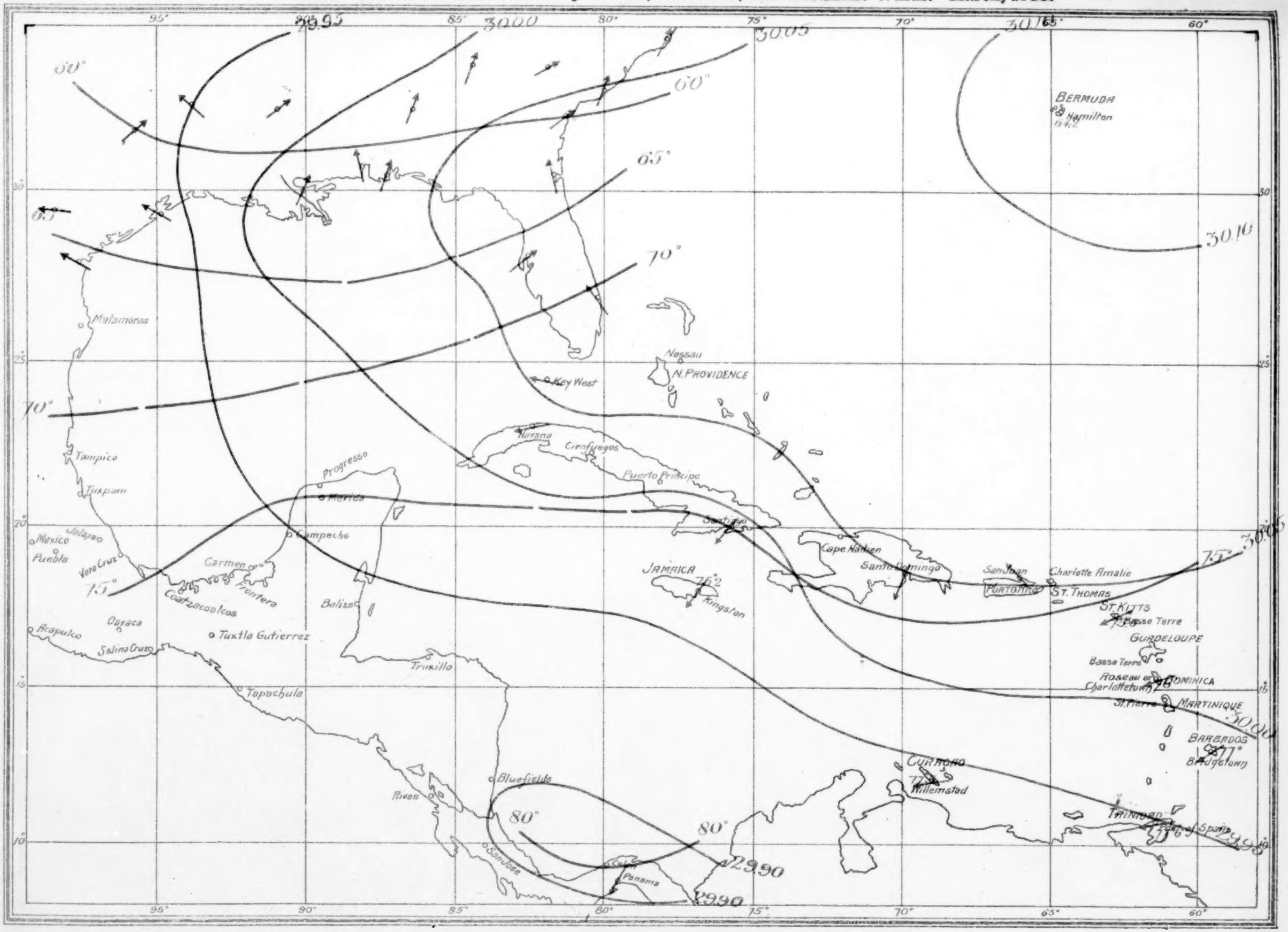

Chart X. West Indian Monthly Isobars, Isotherms, and Resultant Winds. April, 1899.

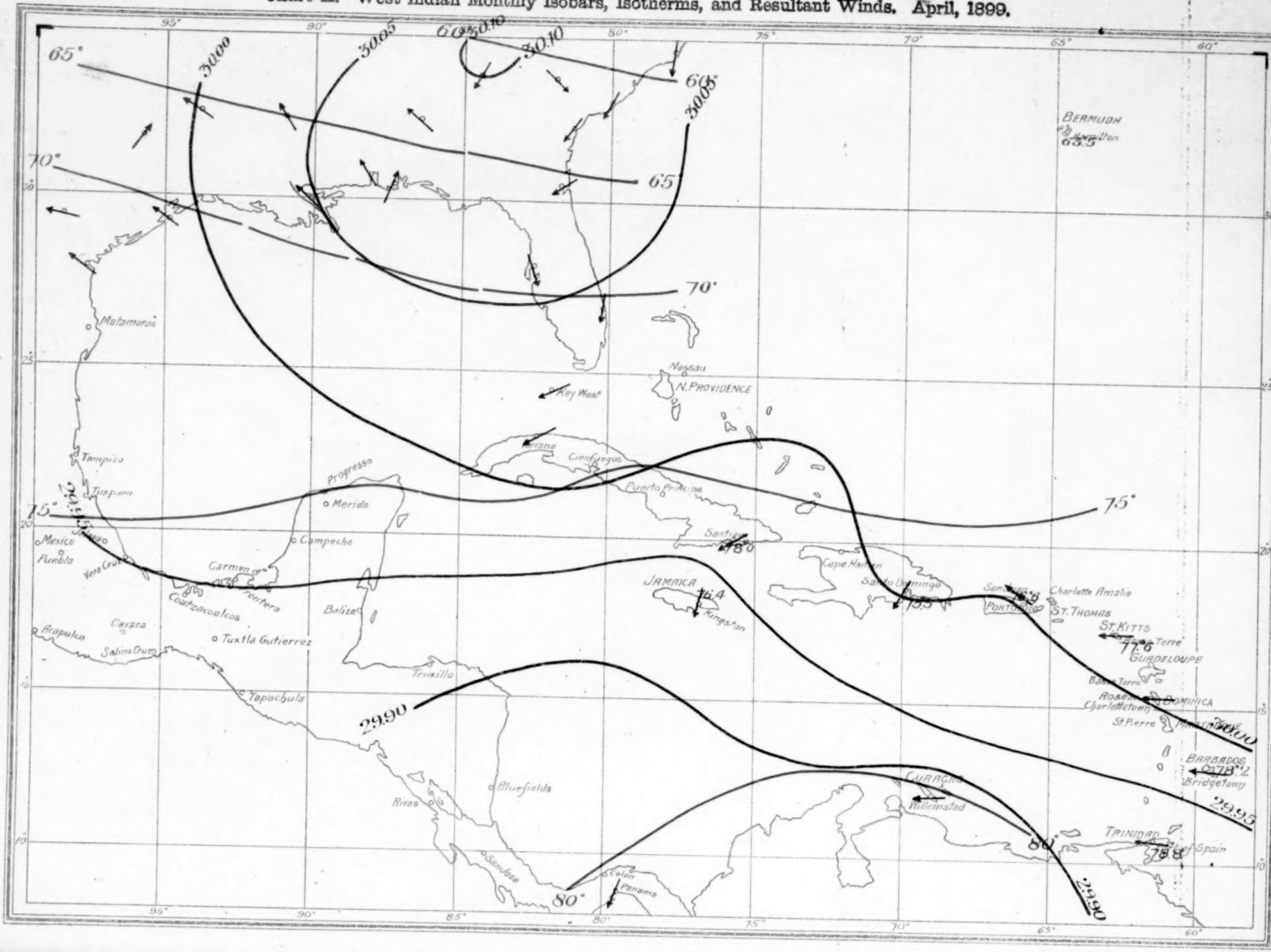

Chart XI. Kites devised by Alexander Graham Bell.